Intergenerational social mobility and general health, oral health and physical function in older adulthood: a study of the association and pathways

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DECLARATION OF AUTHORSHIP

I, Alejandra Letelier, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in this thesis.

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ABSTRACT

Background: Recent research in life course epidemiology has established the relevance of a life course approach when examining the relationship between socioeconomic position, measured as occupational class, and adult health outcomes.

Aims: The present study examined the association between changes in socioeconomic position from childhood to later adulthood, known as intergenerational social mobility and five indicators of adult general health, oral health and physical function. Additionally, the potential pathways to the aforementioned associations were investigated to explore the relative contribution of the social mobility theories: social causation and health selection.

Methods: This study is based on the secondary analysis of data from the English Longitudinal Study of Ageing. Data from wave 3 (2006/07) and wave 4 (2008/09) were used to create nine social trajectories based on parental and adult occupational socioeconomic position. First, regression models were used to estimate the association between social trajectories and the following five outcomes: self-rated general health, self-rated oral health, oral health related quality of life, total tooth loss and grip strength; while controlling for demographic factors, education and health-related behaviours. Then, structural equation modeling was used to assess to what degree these data support the social causation theory and the health selection theory.

Results: There was a linear association between intergenerational social mobility and adult general health and oral health among men and women. Also, a linear association was found with physical function but only among women. There was strong evidence that compared to those who remained stable in high SEP over time, the mobile groups presented higher odds ratios of reporting poor self-rated general and total tooth loss among men and women and lower grip strength among women. Additionally, the general health, total tooth

loss levels and grip strength of the mobile individuals tend to be between the levels of the stable individuals from the SEP they left and the stable individuals from the SEP they joined. However, there was little evidence that the mobile groups had a different risk of reporting poor self-rated oral health and poor oral health related quality of life. Additionally, the structural equation modelling analyses provided strong evidence for both social causation and health selection pathways suggesting that both co-exist, although the social causation effect was much larger. There was statistical evidence of a direct and indirect effect (via adult SEP, education and behaviour) of childhood SEP on self-rated general health, total tooth loss and on grip strength on older adulthood, and evidence of an indirect effect of childhood SEP on self-rated oral health and oral health related quality of life. Also, there was evidence of a direct effect of childhood health on adult SEP, but no indirect effect via education was found. However, the social causation effect was over two times larger than the health selection effect.

Conclusion: The exposure to adverse/protective socioeconomic position over the life course had an additive effect on the health and physical function of older adults. In addition, these findings also suggested that the relationship between socioeconomic position and health is bidirectional, although, the social causation effect is considerably larger than the health selection effect. Finally, these results support that promoting intergenerational social mobility reduces health inequalities in old age.

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LIST OF ABBREVIATIONS

SEP Socioeconomic Position

OECD Organization for Economic Co-operation and Development

NCDS National Child Development Study

ELSA English Longitudinal Study of Ageing

HSE Health Survey for England

SRH Self-rated General Health

SRoH Self-rated Oral Health

OIDP Oral Impact on Daily Performance

NS-SEC National Statistics Socioeconomic Classification

MAR Missing at Random

OR Odds Ratios

Coef Coefficients

SEM Structural Equation Modelling

WLSMV Weighted Least Squares with Mean and Variance

RMSEA Root Mean Square Error of Approximation

SD Standard Deviation

CI Confidence Intervals

SE Standard Error

SOC Occupational Social Class Classifications

CFI Comparative Fit Index

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CHAPTER 1

INTRODUCTION AND LITERATURE REVIEW

1 Introduction and literature review

1.1. Introduction

The association between socioeconomic position (SEP) and adult health is one of the most studied topics in public health research. There is ample and robust evidence to support social inequalities in health. People who have experienced material disadvantages and/or a lower socioeconomic position in childhood and/or adulthood tend to have poorer health at adulthood than their peers from more advantaged backgrounds (Black et al. 1982; Marmot et al. 1997; Galobardes et al. 2008). Even so, life is a dynamic process and contains a series of transitions that could lead people through different socioeconomic paths as they age. Therefore, the consideration of just one time point in life is a very limited approach when drawing conclusions on the effect of SEP on adult health as it usually misses out important information. Research on social mobility takes this into account by adopting a trajectory approach, thereby providing a dynamic long-term view of the effect of SEP on adult health (Power et al. 2013). Moreover, it enables different questions to be posed such as: Do changes in SEP during the life course affect adult health? If so, what are the pathways for this association?

Social mobility is the capacity of individuals or families to change (improve or deteriorate) their socioeconomic position within a society. Change from parental SEP (also named childhood SEP) to one's own SEP in adulthood is known as intergenerational social mobility. It might be that intergenerational social mobility counteracts, to varying degrees, the effect of childhood SEP on adult health. For example, a rise in SEP from childhood to adulthood could have a protective effect leading to better adult health; conversely, falls in SEP could lead to worse health. However, it is also possible that childhood conditions have a strong long-lasting effect on health, and that changes in SEP from childhood to adulthood do not diminish the effect of a disadvantaged or advantaged childhood.

Social mobility has been a topic of great interest to politicians and social medial over the last twenty years. There is a widespread concern that economic growth has not been fairly distributed and that the gap between socioeconomic classes has widened (OECD 2017, Milburn 2017). There seems to be consensus among politicians of all political colours that intergenerational social mobility is desirable as a reflection of a fairer and more inclusive society. Evidence tends to show that countries with higher intergenerational mobility rates have lower social inequality rates (Andrews & Leigh 2009; OECD 2010). In the case of the UK the intergenerational social mobility rate is considerably low in comparison with the other OECD countries (OECD 2017), and the social inequality rate is particularly high when compared with developed countries, with a social inequalities rate (measured by income) similar to that of the United States (OECD 2010). During the last years, the UK political agenda to promote intergenerational social mobility has inclined towards policies focused on childhood conditions and the educational system placing little emphasis on adulthood conditions and on improving employment opportunities. Despite this, child poverty has increased since 2011 and the educational gap between children from disadvantaged and advantaged backgrounds has narrowed little (Milburn et al. 2017). Moreover, according to Goldthorpe (2013), the intergenerational social mobility rate in the UK has been constant during most of the 20th century, suggesting that the association between adult and parental SEP is remarkably robust.

When facing this reality, it is worth asking: what the effect of intergenerational social mobility on adult health is? Understanding how social mobility relates to adult health could help us to clarify the precise mechanisms by which social inequalities in health are preserved. Some authors like Lynch et al. (1994) or Bartley & Plewis (2007) have proposed that encouraging intergenerational social mobility would make a positive contribution to reducing health inequalities, as social mobility promotes more heterogeneous socioeconomic groups, reducing health differentials between social classes. However, other authors like Boyle et al. (2009) have postulated that social mobility could increase health inequalities or at least be partially responsible for the persisting health inequalities by social class (Illsley 1955). This last idea is based on the natural selection theory; postulating that socioeconomic position reflects genetic endowment, those “socially better off” are those with better health conditions in the first place. The healthiest would move to the highest position in the social hierarchy, while less healthy individuals would move to the lowest positions, increasing the health gap between social classes.

The analysis of the relationship between social mobility and health poses a key question – what is the direction of the association? In other words, social mobility may influence health, and health may influence social mobility. Although over the last 50 years a lot of research has focused on these pathways, the direction of the association between SEP and health is still not clearly understood (Marmot et al. 1987; Kröger et al. 2015). Clarifying the direction of association is of great relevance for the implementation of different public policies; if SEP causes health differences in adulthood, policy makers should advocate policies focused on issues such as income redistribution, equal employment opportunities and improved quality of education. However, if differences in health cause changes in SEP, policy actions should be focused on improving health conditions at key life stages (such as childhood), improving access to health care, or improving education/employment prospects for those with chronic diseases (Kröger et al. 2015).

Scholars continue to approach the study of the association between intergenerational social mobility and adult health using diverse health outcomes, but mainly focused on general health outcomes such as self-rated general health and mortality (Kröger et al.

2015). However, intergenerational social mobility may affect different dimensions of adult health. It is relevant to elucidate if the association between intergenerational social mobility and adult health is consistent irrespective of the studied health dimension. Information on how intergenerational social mobility relates to different health domains may help to provide a better understanding of potential mechanisms underlying these associations (Poulton et al. 2002).

Therefore, this study sets out to add new information about the relationship between intergenerational social mobility and general health, oral health and physical function, being one of the few studies exploring these associations in a population aged 50 and over in England. The study follows two goals: first, examine if there is an association between intergenerational social mobility and adult general health, oral health and physical function; and then, explore the bidirectional pathways between SEP and health. Additionally, it will be the first study to explore potential bidirectional associations between intergenerational social mobility and adult health using adult oral health and physical function outcomes.

1.1.1 Why study intergenerational social mobility in older adults?

Most previous research on intergenerational social mobility and adult health has been conducted on populations aged less than 50 years old. This study is focused on a population aged 50 and over, based on three main considerations. Firstly, the manifestations of most chronic diseases and declines in physical function occur primarily in older adulthood (Petersen & Ogawa 2005; Murray et al. 2013); therefore, research based on young populations might not be well placed to address the effect of intergenerational social mobility on adult general health, oral health and physical function and may underestimate this association. Secondly, chronic diseases are cumulative; hence; the disease levels and variations at older ages may better reflect the social trajectory experienced through life. Finally, evidence suggests that social mobility becomes more stable and representative of an individual's destination class after the age of 35 years (Bukodi & Goldthorpe 2009); thus it is more appropriate to observe the long-term effect of intergenerational social mobility on adult health in an older population.

1.1.2 Why study the association of intergenerational social mobility with general health, oral health and physical function outcomes?

This research provides information on the association of intergenerational social mobility with five different indicators of adult general health, oral health and physical function. The selection of these outcomes was based on three considerations. First, there is empirical evidence that all these outcomes are socially patterned. Poor general health (Banks et al. 2006), oral disease (Thomson et al. 2004; Tsakos et al. 2011), and physical function limitations (Birnie et al. 2011a) are associated with SEP in a gradient fashion, being more prevalent in lower SEP groups and less prevalent on higher SEP groups, at different time points over the life course; therefore, these outcomes are particularly suitable for the study of social trajectories and long-term SEP. Second, these outcomes, although some more than others, reflect an accumulation of disease and chronic conditions over time, making them well suited to life course studies. Lastly, poor general health (Marmot & Bell 2010), oral diseases (Kassebaum et al. 2014) and physical function limitations (WHO 2002) are highly prevalent in older age, and have a high impact on individual's quality of life. Therefore, the study of the determinants of these outcomes is of great public health relevance.

1.1.3 The structure of the thesis

The first chapter of this thesis focuses on the background and literature review of this study and is divided in three main sections. The first section introduces the basic concepts of intergenerational social mobility. The second section discusses the existing evidence on the associations between intergenerational social mobility and adult general health, oral health and physical function, identifying the limitations of the existing literature and the potential contribution of this study. The third section describes the possible biological and sociological pathways between intergenerational social mobility and adult general health, oral health, and physical function.

The rest of the thesis is structured as follows. Chapter two presents the main aim, the objectives and the hypotheses of this study. Chapter three describes the methodological aspects of the current study. Chapters four to six present the results of the statistical analyses. Chapter four describes the analytical sample. Chapter five assesses the associations between intergenerational social mobility and adult general health, oral health and physical function through multiple regression models. Chapter six examines the effect of both social mobility theories: health selection and social causation. Specifically, it explores the direction of the association between socio-economic position and health and physical function through structural equation modelling. Finally, chapter seven discusses the major issues arising from this study, compares the results with previous studies and discusses the relevance of the findings.

1.2 Literature review

1.2.1 Social mobility and health: concepts and theories

1.2.1.1 Definition and concepts of socioeconomic position

According to a definition provided by Galobardes et al. (2007, p. 23) socioeconomic position is " the socially derived economic factors that influence what positions individuals or groups hold within the multiple-stratified structure of society"; additionally, Krieger (2001, p. 697) highlighted that socioeconomic position refers to "… an aggregate concept that includes both resource-based and prestige-based measures".

The aggregate concept of socioeconomic position recognizes that position in society might affect health through mainly two different mechanisms: resources and prestige. First, the resource-based measure emphasizes that material and social resources, such as income and educational credentials, impact on individuals living conditions (Duncan et al. 2002). Second, the prestige-based measure recognizes that individual's rank or status within a society may give them and their families access to certain privileges such as better health care, better knowledge, access to goods (Galobardes et al. 2006) and positive psychosocial factors such as more autonomy, sense of control and/or social support (Marmot & Wilkinson 2001).

Several SEP indicators have been used to measure SEP and therefore social mobility. They range from more commonly used indicators, such as occupational status (Power et al. 1999; Elstad 2001; Stansfeld et al. 2011), educational level (Singh-Manoux et al. 2004; Silverwood et al. 2012), and individual or family income (Lynch et al. 1994), to less commonly used measures, such as deprivation scores (Singh-Manoux et al. 2004), and wealth (Gaviria 2002).

To understand the mechanisms through which differences in SEP affect health, the choice of how to measure SEP is very relevant. There is no single "best" indicator of SEP. Each SEP indicator captures a particular dimension of socioeconomic position, which may be differently associated to particular outcomes and stages in the life course (Naess et al. 2004). The divergent findings reported by Blanden et al. (2004) and Goldthorpe and Mills (2008) show this point empirically. Both studies used the same data (British cohort studies of 1958 and 1970) to examine the intergenerational mobility trend among cohorts. When mobility was measured by occupational class (Goldthorpe & Mills 2008) it showed a stable trend, while when it was measured by income (Blanden et al. 2004) it showed a declining trend.

Moreover, not only the type of indicator is important, but evaluating the time period of exposure is also relevant. For example, stomach cancer has been more strongly associated with childhood SEP than with adult SEP (Hart & Davey Smith 2003), suggesting that the timing of the exposure (SEP in this case) is relevant for cancer risk.

Additionally, the level of measurement must also be considered. SEP can be measured at three complementary levels: individual, household, and neighbourhood. Each level may independently impact the distribution of exposures and outcomes (Krieger et al. 1997). For example, empirical research has shown that morbidity and mortality among married women were usually more strongly associated with the household SEP instead with their own SEP (Macfarlane 1990; Pugh & Moser 1990).

In this thesis, socioeconomic position is measured by household occupational class, at two time points, childhood and adulthood. Occupation is used as a term to refer to material and non-material resources that influence the position of an individual within society. The selection of occupational social class as the SEP indicator used in this research was guided by the availability of information in the dataset. Nevertheless, occupation has been recognized as a good indicator of life conditions and chances (Grusky & Cumberworth 2010), and is by far the most commonly used SEP indicator in intergenerational social mobility and health research conducted in Europe. Furthermore, it has been particularly used in the UK where socioeconomic position has been traditionally measured through occupation, being registered on all death certificates (Galobardes et al. 2007) and usually collected in the cohort studies.

Occupational class has important advantages as an indicator of SEP. First, it is a measure of economic position and income capacity, but also of status or prestige position. Grusky & Cumberworth (2010; page 3) exemplifies this very well "At a dinner party we inevitably ask: "what do you do?" (a query almost always answered in occupational terms) because the response locates our new acquaintance in social space in so many ways, telling us about her or his skills and credentials, earning capacity, social contact and friendships, prestige and social worth, career trajectory and opportunities, politics and attitudes and even consumption practices and leisure activities", suggesting that occupational class is a proxy of underlying social realities. Second, collecting information on occupations is relatively simple and in most cases is not a sensitive issue, as other indicators could be, such as income or wealth, therefore representing fewer constraints in terms of reliability, refusal and stability (Hauser & Warren 1997). Third, information on occupation can be reported retrospectively, without the need to collect the data prospectively, allowing to easily collect information of different time points during life course, such as the occupation of the parents or last occupation previous retirement (Song & Mare 2015).

Additionally, occupation is interlinked with other SEP indicators, working conditions may act through a chain effect where parental SEP influences education, occupation (Bukodi & Goldthorpe 2009), income (Savage 2011) and wealth (Charles & Hurst 2003), so a single indicator provides adequate information over a long-term period.

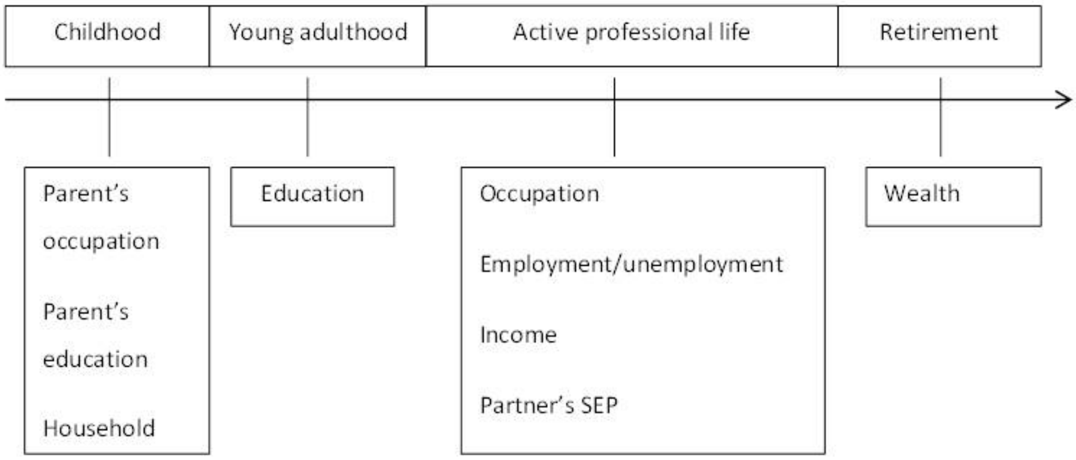


Figure 1. Examples of indicators measuring life course SEP (Galobardes et al. 2006).

1.2.1.2 Definition of intergenerational social mobility

Social mobility may be defined as "…movement between one relatively fulltime, functionally significant social role and another that it is evaluated higher or lower" (Barber 1965, p. 356-357). People who move to a higher SEP are known as "upwardly mobile"; those who move to a lower SEP are known as "downwardly mobile" and those who remain in the same SEP over time are known as "stable". Movements between generations, from parental SEP (also known as childhood SEP) to a subject's own SEP (also known as adulthood SEP) are known as intergenerational social mobility (Grusky & Cumberworth 2010).

1.2.1.3 Social mobility theories

The relationship between social mobility and health may occur in two directions: a) social mobility could affect health (social causation) or b) health could affect social mobility (health selection).

The social causation theory states that social mobility affects health; suggesting that people from higher SEP are exposed to more favourable social determinants of health such as better working conditions (Galobardes et al. 2006), lower stress (Lewis et al. 1998; Mulatu & Schooler 2002), and adoption of healthy behaviours (Karvonen et al. 1999), leading to better adult health; conversely people from lower SEP are exposed to more disadvantaged conditions increasing the disease risk in adulthood. Intergenerational social mobility can affect health by pushing individuals onto more or less advantaged SEP paths (Wilkinson & Marmot 2003), thereby exposing individuals to more favourable/unfavourable social determinants of health (Nunn et al. 2008; Elovainio et al. 2011). Therefore, moving upwards should have a protective effect on health, while moving downwards would lead to worse adult health (Poulton et al. 2002).

The health selection theory states that health determines whether people move up or down through the socioeconomic hierarchy. Healthier individuals would move upwards while the less healthy move downwards (Dahl 1996). This might occur because childhood health may lead to a chain of events; affecting educational attainment, which in turn affects adult employment, income, wealth and adult SEP (Currie & Madrian 1999). The existent evidence related to each of these theories, health selection and social causation, is discussed later in this chapter in section 1.2.2.1.

There is a third concept that can be entangled to both theories: the "indirect selection" or *"indirect social selection" (described by Blane et. al 1993; page 2 and page 7)*. This concept recognizes that the association between SEP and health is, at least partly, affected by third variables, such as education or behaviours (Blane et al. 1993). This concept was introduced by the work of Wilkinson (1986) and West (1988; 1991), putting forward the idea that some third variable may act as predictor of both SEP and health.

It is likely that both theories, health selection and social causation, operate across the life course. Establishing which mechanism has a higher effect is complex, as SEP and health are difficult to disentangle (Feinstein 2000). However, elucidating the relative influence of each theory, the direction of the relationship, and the factors exerting indirect selection, is fundamental to understand how life course SEP relates to health (Batty & Leon 2002).

1.2.1.4 Life course and socioeconomic position conceptual models

A life course approach recognizes how socioeconomic factors operate through the lifespan, providing a more dynamic perspective on how social trajectories relate to adult health, and challenges the usual assumption that the SEP measured at one time point reflects an individual's SEP over a lifetime (Hayward & Gorman 2004). Therefore, it is a particularly suitable approach to study the effect of intergenerational social mobility on health. The life course approach is based on two main conceptual models conceptualizing how life course exposures affect adult health (Ben-Shlomo & Kuh 2002).

The first conceptual model is the "critical period model" also known as "latency model", proposing the presence of a "time window" where exposure to a risk (or health) factor would result in irreversible change. The most well-known example of this is Barker's foetal origin hypothesis (Barker et al. 1989), holding that birth weight, as a marker for intrauterine foetal development and nutrition, independently affects risk of adult coronary heart disease. Barker's hypothesis suggests that early life exposures, in this case prenatal nutrition, can irreversibly affect anatomical structures or metabolic processes. Ben-Shlomo & Kuh (2002) proposed two variations of this "critical period model". The first variation recognizes the effect of later life modifiers. This subtle specification is relevant because emphasizes that, in some cases, an exposure to a risk (or health) factor in a critical period would cause a health effect only if a second exposure is experienced later. For example, early life malnutrition and mineral deficiency at a sensitive period, such as when dental enamel is forming, may cause dental hypoplasia and enamel defects (Psoter et al. 2005; Jacobsen et al. 2014), increasing susceptibility to caries, but tooth decay would only be observed on those individuals with dental hypoplasia and enamel defects that also have subsequent poor diet or deficient dental hygiene. The second variation recognizes that there might be "sensitive periods" referring to the presence of a time window, when an exposure has a stronger (positive or negative) effect on development or disease risk than it would have at other times, but where the exposure's effect may be wholly or partially reversible. It is hard to empirically exemplify the sensitive period effects for chronic conditions. However, a good example is the relative ease with which children can learn a new language against the difficulties that adults face for learn the same (Ben-Shlomo & Kuh 2002).

The second conceptual model is the "accumulation of risk model", proposing that the length of exposure to an adverse circumstance determines future health status. As the number, duration and severity of exposures increase, the biological damage is higher, and the less likely it is that effects can be reversed. For example, repeated exposure to hardship across life course may result in higher exposure to oral cancer risk factors (Petti 2009) such as smoking (Hiscock et al. 2012) and alcohol abuse (Fone et al. 2013), resulting in an accumulation of risk. A first variation of the accumulation of risk model recognized that exposures could be clustered. For example, children that born and raised in low SEP are more likely to suffer inadequate nutrition, be exposed to more violent environment, experience passive smoke, have less educational opportunities, and be more exposed to environmental toxins. A second variation, the "chain of risk model" also known as "pathway model" (Hertzman et al. 2001), recognizes the accumulation effect, including that exposures can be linked to each other. For example, overloaded and stressed parents may use harsher discipline, which is associated with higher risk of adolescent aggressive behaviour (Malinosky-Rummel & Hansen 1993) and dental trauma (Nicolau et al. 2003).

Some authors mentioned social mobility as a different life course model (e.g.: Pollitt et al. 2005). But more than being an extra conceptual model, social mobility encompasses both life course models. The critical period model recognizes that early exposures affect biological functions, influencing the emergence of diseases even decades later. The accumulation model recognizes that this might be complemented by the accumulation of hazards over a lifetime, increasing or decreasing the disease risk. SEP determines the exposure to different hazards. Therefore, a developmental perspective, including early life socioeconomic background and later changes in SEP, seems an accurate approach to understand the wider effect of SEP on health.

The pattern of association between social mobility and the outcome can give some insight into which of the life course models is predominant. If the critical period model is predominant over the accumulative model, it can be expected that social mobility trajectories will have a weak association with the health outcome, and the outcome would be mostly determined by the SEP experienced at certain time point (either adulthood or childhood). On the other hand, if the accumulative model is predominant over the critical period model, a significant association between social mobility trajectories and the outcome can be expected, since different social trajectories would result in an accumulation of beneficial or damaging exposures, positively or negatively affecting adult health. Even so, it might be that there is no association between social mobility trajectories and the health outcome, and that the outcome is only associated with current SEP. This will be further discussed in the next section of this chapter (section1.2.2).

1.2.2 What do we know: evidence on the association between social mobility and general health, oral health and physical function

1.2.2.1 Social mobility and general health

The association between intergenerational social mobility and health has been studied with respect to a wide range of health outcomes and behaviours, such as mortality (Hart et al. 1998) , self-rated health (Elstad 2001), cardiovascular disease (Pollitt et al. 2005) and leisure physical activity (Elhakeem et al. 2016), documenting different conclusions.

The most conventional approach among studies has been to differentiate trajectory groups based on a combination of their position of origin and their position of destination, and subsequently compare the outcome levels between groups. Usually relying on a binary classification of childhood and adulthood SEP (low and high), creating four trajectories: stable high SEP, upwardly mobile, downwardly mobile and stable low SEP.

Studies mainly provided evidence in favour of intergenerational social mobility hypothesis. Moreover, most studies found similar patterns of association. Generally, the stable high SEP group had the lowest levels of disease/mortality, the stable low SEP groups had the highest levels, and the socially mobile groups had disease/mortality levels in between the stable high and stable low SEP group, suggesting that upward social mobility positively improves general adult health and downward mobility negatively affects general adult health. For example, it has been reported that intergenerational upward mobility reduces mortality risk (Hart et al. 1998), is associated with lower body mass index (BMI) (Krzyżanowska & Mascie-Taylor 2011), better self-rated health (Elstad 2001), and lower risk of cardiovascular disease (Pollitt et al. 2005); and downward mobility has been associated with increased risk of adverse cardio-metabolic factors (Elovainio et al. 2011), higher BMI (Krzyżanowska &

Mascie-Taylor 2011), and deterioration of physical and mental health functioning (Singh-Manoux et al. 2004).

Additionally, associations between intergenerational social mobility and behaviours also have been reported (Hart et al. 2008; Elhakeem et al. 2016). For example, Silverwood et al. (2012) found that intergenerational upward mobility was associated with the adoption of healthier behaviours (physical activity). The same was reported by Karvonen et al. (1999) who observed that intergenerational upward and downward mobility were associated with nine health-related behaviours, including smoking, sweets consumption, tooth brushing and physical activity.

Also, several authors (Blane et al. 1999a; Power et al. 2002; Krzyżanowska & Mascie-Taylor 2011) have pointed out that intergenerational social mobility can reduce health inequalities. Generally, the pattern of association between intergenerational social mobility and adult health shows that upwardly mobile individuals tended to have better health than the individuals that remained stable in the SEP that they left, but worse disease levels than the individuals that remained stable in the SEP that the joined, and the contrary for those moving downward. This phenomenon is called the “gradient constraint effect” (Bartley & Plewis 1997; Blane et al. 1999a), suggesting that intergenerational social mobility “constraints” or reduces health differences between SEP groups.

It is important to note that not all studies have come to the same conclusion. Although most literature suggested an association between intergenerational social mobility trajectories and adult health, reducing health differential by social class, the evidence is inconsistent. Some studies have reported no association between intergenerational social mobility and mortality, cardiovascular disease (Davey Smith et al. 1997), self-reported health (Power et al. 1999; Iveson & Deary 2017), blood pressure (Poulton et al. 2002), and limiting-longstanding illnesses (Rahkonen et al. 1997). These findings challenged the hypothesis that promote upward mobility may result in improvement of adult health.

Furthermore, one study has even reported associations suggesting that social mobility can increase health inequalities (Boyle et al. 2009), though this study made no distinction between intergenerational (changes in SEP between generations) and intragenerational social mobility (changes in SEP at different life stages on the same individual).

In the context of such diversity in the evidence, it is important to consider methodological factors that may influence interpretation. Seven methodological factors that are relevant for interpretation can be identified from the previously mentioned literature.

First, the different findings among studies might be due to methodological differences in relation to which SEP indicator and health outcome were used. Regarding SEP indicators, most studies used occupational class, and only a few have also used alternative SEP indicators such as deprivation score (Boyle et al. 2009). However, the outcomes vary greatly between studies. As already mentioned (section 1.2.1.1), SEP indicators might relate differently with different outcomes. No study underlines this distinction, and usually authors have tended to ignore discussing how the characteristics of the studied outcome relate to social mobility.

Secondly, different findings among studies might be due in part to the different ages of the samples. Most studies have been conducted on a young/midlife population (e.g. Power et al. 1999; Singh-Manoux et al. 2004; Krzyżanowska & Mascie-Taylor 2011). These studies might have underestimated the long-term effects of intergenerational social mobility on adult health. For example, Poulton et al. (2002) reported no association between social mobility and BMI in a population aged 26 years old; while Elovainio et al. (2011) reported a significant association between social mobility and BMI in a population aged between 35 and 55 years old. These results may be related to the fact that the prevalence of overweight and obesity increases with age (Wells et al. 2007), and the results of Poulton et al. (2002) might just be underestimating the effect of social mobility on weight. But it also may be that the association might be different at different ages. This might be also the case of the differences between the findings of Power et al. (1999) and Elstad (2001) on the association between social mobility and self-rated health. Power et al. (1999) reported no association on a population aged 33 years old, while Elstad (2001) found a positive association on a population aged between 30 and 69 years old.

Thirdly, the vast majority of the studies exploring the association between intergenerational social mobility and adult health restricted their samples to working age individuals. There is not much evidence about how intergenerational social mobility is associated with health post retirement. One possible reason why previous researchers decided to study intergenerational social mobility in younger populations may be related to the fact that occupational class is the most widely used SEP indicator, and therefore several studies decided to not include unemployed or retired individuals (e.g. Singh-Manoux et al. 2004). But it could also be related to the availability of the data. For example, most longitudinal studies conducted in the United Kingdom follow the lives of individuals since childhood and their participants have not yet reached a retirement age (UK data Service, 2017).

Fourth, most, but not all, of the published studies operated with the simplest scenario of SEP levels (high and low SEP) which can remove meaningful information on the variation of SEP across life (Elhakeem et al. 2016). Incorporating three or more SEP levels (e.g. low, middle, high) allows a more informative analysis, permitting, for example, to compare the difference between moving one step (e.g. from low to middle SEP) or two steps (e. g. from low to high SEP) in the socioeconomic ladder. Furthermore, similarities among studies could disappear when a different SEP classification approach is adopted.

Fifth, several of the reviewed studies were limited to males (e.g. Davey Smith et al. 1997; Hart et al. 1998; Elstad 2001), and those including women usually used occupation class measured at the individual level. As already mentioned (1.2.1.1), women may interact differently with the economic and/or social system than men; a household level SEP may be more informative than an individual level approach to analyse women's SEP.

Sixth, some of the social mobility analyses were not adjusted for potential confounders (e.g. Rahkonen et al. 1997; Power et al. 1999; Elstad 2001; Singh-Manoux et al. 2004; Krzyżanowska & Mascie-Taylor 2011), limiting to only adjusting for gender and age. This is an important limitation because it has been recognized that third variables, could influence the relationship between social mobility and the outcome (Blane et al. 1993). For example, social mobility may act as a predictor of adult health not because of a direct effect on adult health, but through an effect on education or childhood deprivation. Identifying these variables may help to understand the pathways between SEP and health.

Finally, research into intergenerational social mobility and adult health has tended to focus on estimating the effect of intergenerational social mobility in explaining social gradients in health without make exploring the two social mobility theories: social causation and health selection. Moreover, the studies aiming to understand the pathways between social mobility and adult health have generally focused on only one of the theories, either health selection or social causation (e.g. Manor et al. 2003). However, Elstad (2001) argued that to quantify the effect of social causation the effect of health selection also needs to be quantified and vice-versa. This is further described on section 1.2.3.

1.2.2.2 Social mobility and oral health and physical function

While the association between social mobility and general health outcomes such as mortality and self-rated health has been extensively investigated, less research has explored the effect of social mobility on other outcomes such as oral health or physical function.

The benefit of including more than one health outcome in social mobility research is adding information about how SEP relates to health, and to examine whether the results differed depending on the type of outcome assessed. For instance, self-assessed measures are more indicative of the current situation and include a variety of physical and emotional components (Reisine & Bailit 1980; Goldstein et al. 1984). Physical function related outcomes such as tooth loss and grip strength are more indicative of lifetime experiences, directing the attention to consequences of long-standing circumstances and accumulation of risk (Rahkonen et al. 1997). Moreover, it is important to identify whether the association between social mobility and adult health is the same across all health domains or if it is domain specific. The specificity of the association may help to recognize risk factors of adult disease (Poulton et al. 2002).

Social mobility and oral health

There is strong evidence about social inequalities in adult oral health by socioeconomic position. Exposure to adverse childhood SEP or adult SEP contributes to increased oral disease risk in adulthood (Poulton et al. 2002; Thomson et al. 2004; Nicolau et al. 2007; Bernabé et al. 2011; Tsakos et al. 2011; Listl et al. 2014). But while the association between SEP and oral health has been repeatedly shown, intergenerational social mobility and its effect on oral health remains less explored and the results differ between studies.

All the published literature exploring the association between intergenerational social mobility trajectories and adult oral health relies on eleven publications, from six nations: New Zealand, Brazil, Australia, United Kingdom, Finland and South Korea.

The two studies from New Zealand, conducted on individuals aged 26 from the Dunedin longitudinal study, reported that downward and upward mobility were associated respectively with higher and lower risk of caries and tooth cleanliness; but no association was found with periodontal markers (Poulton et al. 2002; Thomson et al. 2004). Similarly, a national study on people aged 30 and over in Finland, found that intergenerational social mobility affected the level of caries, total tooth loss and self-rated oral health, but not periodontal disease; reporting a graded decline in oral health from stable high, upward, downward mobility to stable low (Bernabé et al. 2011). Correspondingly, the study conducted by Peres et al. (2011) in a birth cohort in Pelotas-Brazil on individuals aged 24, found a linear association between social mobility and unsound teeth. Likewise, the analyses from the National Child Development Study (NCDS) in the UK conducted by Delgado-Angulo & Bernabé (2014; 2015) reported that downward mobility had a detrimental effect on oral health and that upward mobility may diminish the negative impact of a disadvantaged childhood on oral health, measured as subjective trouble with mouth and gums, at age 33 years. Additionally, both studies proposed that proximal experiences might have a stronger effect on oral health than experiences at earlier stages. Also, Brennan & Spencer (2014; 2015) reported that individuals aged 30 in Australia from the lower stable group had more oral health impacts than the upwardly mobile group, which had similar oral impact as the high stable group. Lastly, a recent study conducted on a Korean sample aged 50 and over, reported positive association between social mobility trajectories and tooth loss (Han & Khang 2017). Those at the stable low SEP had the higher prevalence of total tooth loss, those at stable high SEP had the lowest prevalence, and the socially mobiles groups presented total tooth loss levels in between. Although, this last study used income as the SEP indicator, which can overestimate the downward mobility trajectories when is used in an older population.

All the above studies showed an association between social trajectories and adult oral health. However, other studies did not. Pearce et al. (2009) studied longitudinal data from a sample aged 50 years in England, reporting no association between social mobility and oral health related quality of life; and an association with tooth loss was only found among women. Likewise, Shin et al. (2015), found an association between downward mobility and periodontal disease only among Korean women aged 30-49. But the results of this Korean study might not be reliable as some trajectory groups had very low prevalence.

The different findings among studies might be due to methodological differences in SEP measures, populations studied or outcomes assessed. The variety of oral health outcomes makes comparisons very complex. The repeatedly reported lack of association between social mobility and periodontal disease (Poulton et al. 2002; Thomson et al. 2004; Bernabé et al. 2011; Shin et al. 2015) might be related to the age of the samples. The lack of association may be partially reflecting the fact that there may not be an association for that specific age group. Periodontal disease is more common in older populations (Petersen & Ogawa 2005), and all the above mentioned studies were conducted on young populations. Additionally, the lack of association between social mobility and tooth loss and oral health related quality of life reported by Pearce et al. (2009) might also be related to the age of the sample or it may be due to sample size, as the sample was small with some trajectory groups having very low numbers.

Lastly, to date, no study has attempted to measure the effect of social causation and health selection on adult oral health outcomes.

Social mobility and physical function

Similar to general and oral health, individuals from disadvantaged backgrounds experience a faster decline in physical function in later life than those from more advantaged backgrounds (Birnie, et al. 2011a; Hurst et al. 2013; Murray et al. 2013; De Vries et al.

2014). For instance, low parental SEP has been associated with lower adult grip strength (Birnie, Cooper, et al. 2011), which is an objective measure of physical capacity and a marker of later disability and mortality (Laukkanen et al. 1995; Rantanen et al. 1999; Birnie, Cooper, et al. 2011; Webb et al. 2011).

However, despite the substantial evidence of an association between SEP and adult physical function, research related to the association of intergenerational social mobility and adult physical function is very limited. Only two published studies have explored the association between intergenerational social mobility and physical function using clinical measures. The first one is the Birnie et al. (2011b) study, conducted on two samples of individuals aged 45 and over living in England. This study suggested that the levels of walking speed and balance of the upwardly and downwardly mobile individuals tended to be between the levels of the stable individuals from the SEP they left and the stable individuals from the SEP the joined, although their results were not statistically significant; maybe partly due to the sizes of the samples which were small. The second study was conducted by McCrory et al. (2015). They examined the association between intergenerational social mobility and grip strength and walking speed using data from the Irish Longitudinal Study of Ageing. Their results showed no association between social mobility and adult physical function. However, in their discussion, they recognized a chain effect between childhood SEP, adult SEP and adult physical function, although this is not reflected in their results. Some few studies explored the association between intergenerational social mobility and physical function using subjective self-rated function measures. For instance, Singh-Manoux et al. (2004) supported an association between intergenerational social mobility and adult function. However, this study made no distinction between physical and mental function.

Again, there is no study exploring the effect of the social mobility theories, social causation and health selection, on adult physical function.

1.2.3 Evidence on health selection and social causation

Earlier reviews on the association between socioeconomic position and adult health usually focused on just one of the social mobility theories, either health selection (West 1991; Blane et al. 1993) or social causation (Williams 1990; Feinstein 1993; Kaplan & Keil 1993).

Health selection is still a very controversial topic. The health selection hypothesis stipulates that health determines which individuals move upward, downward or remain stable in the same SEP over time (section 1.2.1.3). The most common conclusion of studies exploring a health selection effect is that health selection has a small effect on health differentials by social class. Even so, some studies support the idea that childhood health directly affects social mobility. Some authors have recognized that under certain extreme health circumstances, such as serious mental illnesses, health status can result in downward social mobility (Turner & Wagenfeld 1967; West 1991; Dohrenwend et al. 1992). For instance, Stansfeld et al. (2011), reported that childhood depressive and anxiety disorders are associated with manual adult SEP; and Manor et al. (2003) reported that serious illnesses in childhood are related to downward mobility**.** However, this relationship is not as clear for other health conditions. The majority of published studies have found that even when childhood health influences adult SEP, the association tends to be very weak (Fox et al. 1985; Blane et al. 1993; Power et al. 1996; Rahkonen et al. 1997; Elovainio et al. 2011).

The social causation hypothesis, which stipulates that SEP affects health through different mechanisms, has received a large amount of empirical support by researchers from different public health fields such as social epidemiology (Lundberg 1991), cardiovascular disease (Davey Smith et al. 1997), life course epidemiology (Hart et al. 1998; Power et al. 1999), mental health (Johnson et al. 1999), and behavioural sciences (Elhakeem et al.

2016). It is widely recognized that environmental disadvantage associated with lower SEP contributes to adult disease.

As early as the Black Report it was suggested that the contribution of health selection to adult health is much lower than the contribution of social causation; emphasizing a direct influence of economic deprivation on the variation in adult health (Black et al. 1982).

However, despite Black's suggestion and the extended debate about social mobility theories, there is a remarkable paucity of research measuring the effect of both pathways in the same model. One of the few studies testing both social mobility theories at the same time is the study conducted by Warren (2009). Warren used structural equation models to compare the effect of social causation and health selection on self-reported health, musculoskeletal health and depression. His results provided strong evidence to support social causation, but no evidence to support the health selection theory.

A more recent systematic review conducted by Kröger et al. (2015), reviewed studies that measured both competing theories: social causation and health selection. They found six studies that included measures of health and SEP at childhood and adulthood. Three of these studies measured mental health outcomes (Miech et al. 1999; Huurre et al. 2005; Stansfeld et al. 2011), and three measured self-rated general health (Case et al. 2005; Haas 2006; Palloni et al. 2009). All six studies reported findings that supported both directions of causality, social causation and health selection. However, there is no consensus on which of the theories, social causation or health selection, has a larger effect. Three of the studies concluded that both theories have similar size effect (Miech et al. 1999; Haas 2006; Stansfeld et al. 2011), one concluded that social causation has a larger effect than health selection (Palloni et al. 2009), one study reported the opposite (Huurre et al. 2005), and one study only reported that both theories have an effect but gave no information on which was larger, and the estimated coefficients for each theory were difficult to compare (Case et al. 2005).

Overall, the existing evidence on the effect of the social causation and health selection theories has yielded mixed results. Differences in the methodology adopted between studies are likely to represent at least part of the discrepant findings reported.

One particular concern is that most of the studies reviewed so far, although not all of them, have neglected to control for third factors that may influence both, SEP and health, and only controlled for age and gender (e.g. Huurre et al. 2005; Elovainio et al. 2011; Stansfeld et al. 2011). Previous research has repeatedly shown that health and SEP are associated with third factors such as educational level (Davey Smith et al. 1994) or family situation (Robards et al. 2012). In fact, while the social mobility theories differed regarding the causality direction, the "indirect selection" hypothesis proposes that the association between SEP and health is in part mediated by third variables. For example, there is considerable evidence that childhood health affects educational attainment, which has been recognized as a SEP indicator by itself and as a key determinant of other SEP indicators, such as occupational class (Lynch & Kaplan 2000). In turn, education might affect adoption of behaviours that could also affect adult SEP and health (Fone et al. 2013). Therefore, the observed association between SEP and health in adulthood might be in part reflecting the impact of childhood conditions on third factors such as education or behaviours. Consequently, accounting for third variables is important in term of understanding the relative impact and the pathways of the social causation and health selection theories.

Also, researchers often mentioned the complexity of separating the bidirectional effect of SEP and health. But the same authors generally used statistical methods that do not allow modelling the pathways between health and SEP (Miech et al. 1999; Case et al. 2005;

Stansfeld et al. 2011). Most studies exploring social mobility theories have used more conventional statistical methods such as regression models. Although regression is a strong analytical approach to test association, this approach does not allow to empirically disentangle the pathways between SEP and health. Alternative pathways approaches, such as structural equation models, have been less utilized, even when they seem more appropriate to unravel the relationship between SEP and health, modelling the direct and indirect effects between SEP, health, and third variables.

An additional concern about the existing literature is the repetition of studies using the same data source. For example, three of the six studies evaluated in the Kröger et al. (2015) review were based on the 1958 NCDS cohort study (Case et al. 2005; Palloni et al. 2009; Stansfeld et al. 2011). This gives the idea of valid results from diverse studies. However, the data is the same from one study to the other, and therefore the results are not fully independent from each other. Studies from different populations and cohorts can add valuable information on how SEP relates with health.

Finally, Kröger et al. (2015) classified the studies included in their review in low, middle and high quality studies, based on how these studies addressed five methodological issues: 1) measurement error of the used variables, 2) percentage and handling of missing values, 3) comparability of coefficients used to test each theory, 4) controlling for confounders and, 5) used of simultaneous equations. All the cited studies were classified as middle and low quality studies, except from the study conducted by Warren (2009). The publication of high quality studies would give a stronger support on the existence and size effect of the social mobility theories.

1.2.4 Summary of gaps in the literature

To date, intergenerational social mobility research has mainly focused on the association between social mobility and outcomes related to general health such as mortality and self-rated health. Fewer studies have focused on the effect of intergenerational social mobility on adult oral health, and physical function, and very few studies have looked at how different outcomes relate differently with intergenerational social mobility.

Additionally, previous research on intergenerational social mobility and adult health and physical function have found conflicting results; this may have been partly due to the different methodologies used among the studies, making it difficult to draw any firm conclusions.

As mentioned, most studies have focused their attention on young/midlife working populations. Very few studies have assessed intergenerational social mobility and adult health and function with data gathered from a large representative sample of people aged 50 and over.

Additionally, a considerable amount of the literature has analysed the effect of social mobility only in men, and most of the literature that includes women has used an individual level SEP approach, although this is not necessarily representative of the real SEP of women or individuals that are economically inactive (out of the labour market).

Also, the vast majority of studies classified SEP into two groups (low vs. high), missing out important information about how more subtle changes in SEP (e.g. from low to middle SEP) can affect health.

In addition, few studies have attempted to measure the relative effect of both social mobility theories, social causation and health selection, and several of these studies have not used pathways analysis. Furthermore, no study has attempted to analyse the relative contribution of the social mobility theories on adult oral health or physical function.

Therefore, this study aims to address some of the gaps in the literature by examining a national sample of the English population aged 50 and over, which may add relevant information on the association between intergenerational social mobility and adult general health, oral health and physical function. The present analysis addresses the criticisms to previous research and includes a representative sample of men and women, measuring SEP at the household level and categorising occupational class in three-levels: high, middle and low.

Moreover, this is one of the few studies that explores the bidirectional association between social mobility and health, assessing both social mobility theories, health selection and social causation; and is the first study to explore the magnitude of the association of both theories, on adult oral health and physical function.

1.3 Proposed pathways between SEP and health

The previous sections presented evidence on the association between intergenerational social mobility and adult health. The potential biological and sociological pathways of this association are discussed below. Figure 2 provides an illustration of the potential pathways between socioeconomic position and adult general health, oral health, and physical function.

The model presented integrates the life course perspective. It combines the importance of the social determinants of health, early-life circumstances, and the socioeconomic trajectories experienced across the life span.

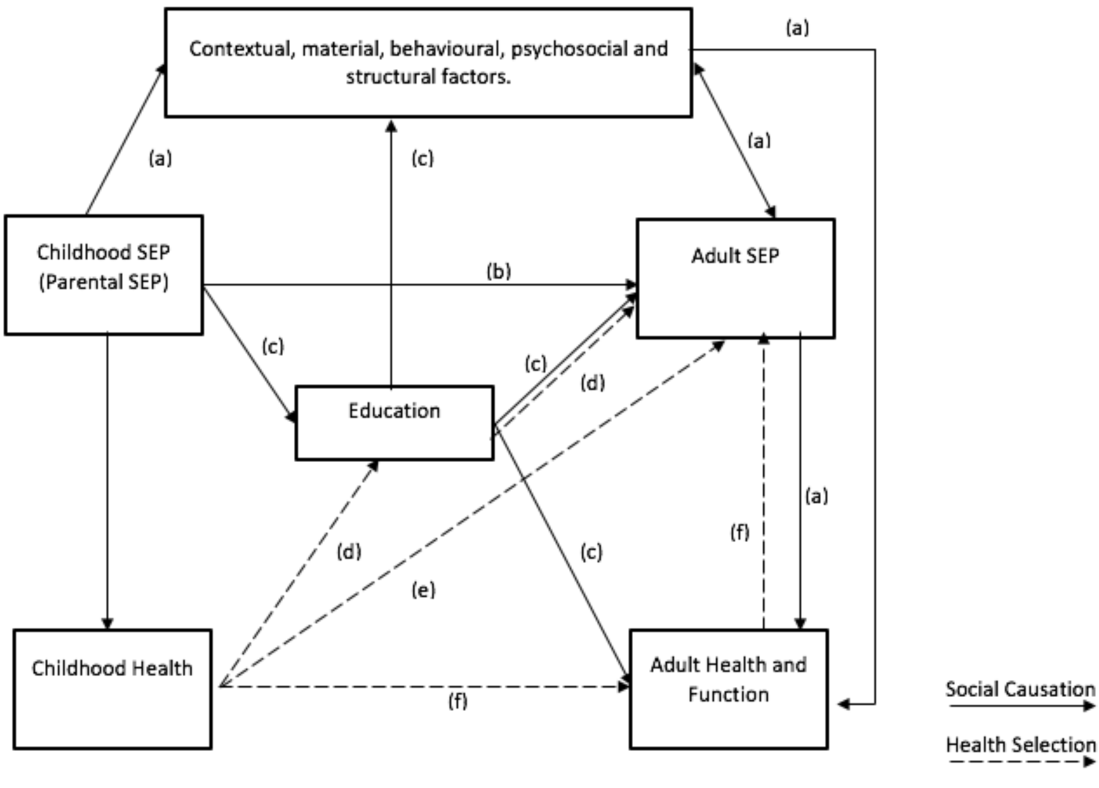


Figure 2. Social mobility pathways: social causation and health selection.

1.3.1 Social causation proposed pathways

The solid arrows in Figure 2 depict the pathways linked to social causation. There are three pathways that may link childhood SEP, adult SEP and general health, oral health and physical functioning at older adulthood.

The first pathway (path a) centres on the effect of SEP on the wider social determinants of health and behaviours. It is based on the materialist mechanisms initially identified in the Black report (Black et al. 1982). The socioeconomic context, in childhood and adulthood, is related to the material, psychosocial, and structural environment that individuals experience. Those in higher SEP are exposed to safer environments, lower stress levels, better access to goods like housing and food, and better access to health care (Kaplan et al. 1996; Lynch et al. 1997). Also, SEP material circumstances shape behaviours such as smoking and diet (Schrijvers et al. 1999). An example of this pathway is that SEP material circumstances in childhood and adulthood shape environmental factors such as health care access (Martinson 2012) influencing disease prevention.

A second social causation pathway (path b) is based on the inheritance of the parental background. Born and growing up in a disadvantaged SEP increases the risk of low adult SEP. Conversely, children from an advantaged SEP have increased chances of preserving a better SEP in adulthood, even after adjusting for education and other meritocratic indicators (Breen & Goldthorpe 2001).

A third pathway (path c) emphasises the role of education on social trajectories. Education has been recognized as the most influential factor of SEP changes from childhood to adulthood, enabling individuals to achieve different SEP according to their merits instead of their origin SEP (Erikson & Goldthorpe 2002). Education is linked to employment and income, which in turn is related to more favourable circumstances and healthier lifestyles (Ross & Wu 1995; Conroy et al. 2010). Moreover, some authors have proposed that education can also become “biologically embedded” promoting the development of neuronal connections (Miller & O’Callaghan 2008). Therefore, education may not only affect adult SEP but also directly affect health (Ross & Wu 1995; Miech & Hauser 2001; Kawachi et al. 2010). Lastly, education might also influence behaviours. For example, it has been suggested that more educated individuals were less likely to smoke and more likely to have healthier diets independently of other SEP indicators such as social class and neighbourhood deprivation (Robinson et al. 2004; Gilman et al. 2008).

1.3.2 Health selection proposed pathways

The dashed lines in Figure 2 represent the health selection pathways. These pathways illustrate how early life health can lead individuals through different SEP paths. There are three potential pathways.

The first pathway (path d) emphasizes the potential role of education; it might be that poor childhood health affects adult SEP through educational attainment. For example, children with cancer miss classes due to treatments (Eiser & Vance 2002). Furthermore, cancer treatment secondary effects can cause sleeping problems, which in turn affects concentration and school performance (Kaleyias et al. 2012). Therefore, a chain reaction may occur: poor health affects education, affecting employment, income and wealth; all SEP indicators.

The second pathway (path e) suggests that childhood health directly determines adult SEP and can thereby shape social mobility and subsequently affect adult health (Manor et al. 2003). For example, some childhood psychological disorders might increase the likelihood to move downwards in terms of socioeconomic position (Dohrenwend et al. 1992; Stansfeld et al. 2011), independently of other variables such as education. Conversely, although very controversial, some authors had suggested that some inherited characteristics, such as intelligence, measured by the intelligence quotient (IQ), might increase the likelihood to move upwards (Deary et al. 2005).

The third pathway (path f) proposed that childhood health could directly shape adult health. For example, it has been well established that caries levels follow track lines; this means that knowing the level of caries at certain ages would allow the prediction of dental caries later in life (Massler et al. 1954; Broadbent et al. 2006). Therefore, childhood disease would have a long-term effect on health, which in turn can affect adult SEP.

As a final point, it is likely that all these pathways are interrelated. Therefore, the proposed figure is only a simplified illustration.

CHAPTER 2

AIM AND OBJECTIVES

2 Aim and objectives

2.1 Aim

This study has two main aims. First, to assess whether intergenerational social mobility is associated with adult general health, oral health and some aspects of physical function in a population aged 50 and over in England. Second, to explore the direction of the association by testing both social mobility theories: health selection and social causation.

2.2 Objectives

1. To assess the prevalence of intergenerational social mobility trajectories in the population in England aged 50 years and over, and to describe the socio-demographic characteristics associated with each social mobility trajectory group.
2. To assess the associations between intergenerational socioeconomic trajectories and adult general health and oral health, measured as self-rated health, self-rated oral health, total tooth loss and oral impacts on daily performances.
3. To assess the associations between intergenerational social mobility trajectories and physical function, measured as grip strength.
4. To assess the relative contribution of health selection and social causation on the associations of intergenerational social mobility and adult general health, oral health and physical function.
5. To compare if the associations differ depending if the outcome was an indicator of current health (self-rated health, self-rated oral health, oral impacts on daily performance) or an indicator of lifetime experiences (grip strength and total tooth loss).

2.3 Hypotheses

2.3.1 Hypothesis 1

There is a linear association between intergenerational social mobility trajectories and adult health, oral health and physical function. People who remained stable in the high SEP will have the best levels of adult general health, oral health and physical function. The stable low SEP group will have the worst levels of adult health, oral health and physical function. The upwardly and downwardly mobile groups will have an intermediate position within the gradient. The health and function levels of the individuals moving upward will be better than the levels of those individuals who remained stable in the initial SEP, but worse than the levels of the individuals who remained stable at the destination SEP. And the reverse for those individuals moving downward.

2.3.2 Hypothesis 2

Both intergenerational social mobility theories, social causation and health selection, have a significant effect. Compared with social causation, health selection has a more modest impact on the association of intergenerational social mobility with adult general health, oral health and physical function.

2.3.3 Hypothesis 3

Indicators of lifetime experience of health and function (such as grip strength and total tooth loss) have a stronger association with intergenerational social mobility trajectories than self-perceived measures of health (self-rated health, self-rated oral health and oral impacts on daily performance).

CHAPTER 3

METHODOLOGY

3 Methodology

This study is based on the secondary analysis of data from the English Longitudinal Study of Ageing. The research process involved two main stages, using two different analytical approaches. The first stage was focused on exploring the association between social mobility trajectories and five health and physical function outcomes. In this stage, the analytical method was multiple regression. The second stage aimed to assess the relative contribution of both social mobility theories - social causation and health selection - on the association between social mobility and adult health and function. In the second stage, the analytical method was structural equation modelling.

This chapter describes the methodology adopted at each stage. First the dataset is presented. Next, the outcomes and explanatory variables used in this study are described including how they were coded. Then the adopted approach to handling missing data and the sampling procedure are explained. Finally, the statistical analysis of both analytical stages, regression and structural equation, are described.

3.1 Dataset: the English Longitudinal Study of Ageing (ELSA)

3.1.1 Overview of ELSA

ELSA is an on-going longitudinal study and multidisciplinary project that follows the lives of a community dwelling sample of approximately 12,000 individuals living in England aged 50 and over. ELSA's sample was designed to be a representative sample of the older age population living in private households in England. It has been drawn from individuals that previously participated in the Health Survey for England (HSE), which is an annual cross-sectional household survey that gathers a wide range of health data and biometric measures.

The original cohort was selected from three HSE's survey-years: 1998, 1999 and 2001. The inclusion criteria stipulated that individuals must be living in a private residence in England, born before 29 February 1952 and allowed to be contacted for further interviews. The first wave of ELSA started in 2002/2003. At the time of writing, data from seven waves have been released (Figure 3). As the study progressed and the original sample was getting older, the sample was refreshed with new individuals at waves three, four, six and seven in order to represent the younger cohorts and to compensate for attrition (Steptoe et al. 2013; Banks et al. 2014).

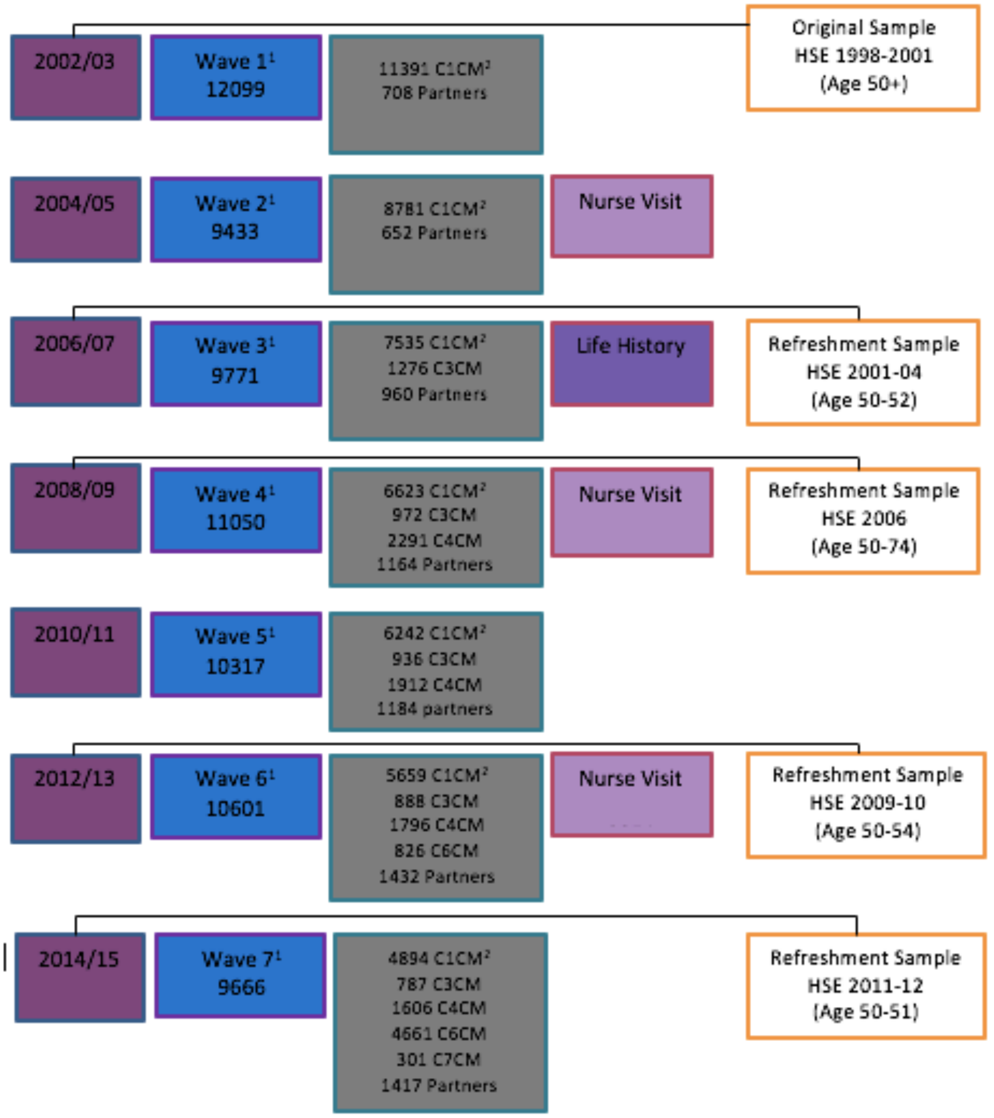
ELSA was designed to collect high quality longitudinal data about health trajectories, disability, biological markers, socioeconomic circumstances, social relationships, networks and well-being (Steptoe et al. 2013). Participants are contacted every two years for follow-up. At each wave, all members were interviewed face-to-face and responded to a self-completion questionnaire. Although the aim was to collect the same data throughout the waves, some new questions have been added and other questions were omitted in some waves. But most of the questions remained the same through all the waves.

Additionally, waves two, four and six included a nurse visit; and wave three included a life history interview (Figure 3). The nurse visit includes a face-to-face interview, collection of biological samples, anthropometrical measurements and measures of physical functioning. The life history data were collected via a retrospective questionnaire, with the aim of gathering detailed information about the participant's important life-time events and childhood (Marmot & Breeze 2008). A special method called "life-grid" was used. The "life-grid" is a visual approach that helps individuals to recall past events more accurately. Specifically, it is a calendar that allowed respondents to time-line several life events, and includes key historical events as temporal references to aid individuals remembering when past events of their life occurred (Ward et al. 2009). The life history interview captured, among other information, retrospective data about childhood circumstances including childhood health.

The information collected in ELSA is particularly suitable for the study of intergenerational social mobility and the exploration of the bidirectional association between social mobility and health and physical function. On the one hand, it includes information about changes on SEP over the life course, offering the opportunity to observe the effect of intergenerational social mobility on adult health. And on the other hand, it allows the exploration of the effect of childhood health on social mobility.

3.1.2 Funding and ethical approval

ELSA is collaboration between University College London, the Institute for Fiscal Studies, the University of Manchester and the National Centre for Social Research. It is mainly funded by a consortium of UK government departments coordinated by the Office for National Statistics and the US National Institute of Ageing. Ethical approval was obtained from the Multi-Centre Research Ethics Committee.



[1]Sample size for complete study
[2]C1CM: Core Member Cohort 1; C3CM: Core Member Cohort 3; C4CM: Core Member Cohort 4; C6CM: Core Member cohort 6
Adapted from (Steptoe et al. 2013) with information from (Banks et al. 2014; Bridges et al. 2015; Banks et al. 2016).

Figure 3. ELSA structure from wave 1 to wave 7.

3.2 Study design

3.2.1 Study samples

This study used individual level data from ELSA waves 3 and 4, collected longitudinally. Information about general health, oral health, physical function, health-related behaviours and socio-demographic characteristics was used. These data from all individual respondents were linked using a unique individual analytical serial number connecting information across waves and linking different files.

Wave selection was based on the availability of data for the outcomes and explanatory variables. In ELSA, general health (self-rated health) was assessed in the main questionnaire in all waves. Oral health was assessed in the main questionnaire at waves 3, 5 and 7. Physical function (grip strength) was assessed during the nurse visits at waves 2, 4 and 6 (Table 1).

Two different analytical samples were used in this study. The first analytical sample used data from wave 3 to explore the association between social mobility trajectories and general health and oral health. Wave 3 was chosen to explore the association with general and oral health because this is the only wave that included information about childhood health collected at the life history interview. The second analytical sample used data from wave 4 to explore the association between social mobility and physical function. Wave 4 was chosen to explore the association with physical function because this is the closest wave to wave 3 that can be linked with the life history data and includes a refreshed sample incorporated at wave 3. Moreover, wave 4 contained the largest number of individuals who had their grip strength measured at a nurse visit (8,496 deposited cases at wave 4).

Table 1. ELSA data by waves

	wave 1	wave 2	wave 3	wave 4	wave 5	wave 6	wave 7
General Health	x	x	x	x	x	x	x
Oral Health			x		x		x
Physical function		x		x		x	
Childhood General Health			x				
Adult Occupation	x	x	x	x	x	x	x
Parental Occupation	x	x	x	x	x	x	x
Education	x	x	x	x	x	x	x
Health-related behaviours	x	x	x	x	x	x	x

3.2.1.1 Wave 3 sample (2006/2007)

The wave 3 initial sample contains a total of 9,771 main interviews, including 7,535 individuals classified as cohort 1 core members (C1CM) (77.1% of the wave 3 sample). C1CM are criteria-eligible individuals selected from HSE 1998/1999/2001 who participated at ELSA wave 1. Additionally, this wave included a refreshment sample aiming to represent the youngest group, as the initial sample was getting older. The refreshment sample consisted of 1,276 individuals classified as cohort 3 core members (C3CM) (13.1% of the wave 3 sample), which are newly eligible individuals selected from HSE 2001 to 2004 who were between 50-54 years old at wave 3. Finally, wave 3 also includes 960 core member partners (9.8%).

From the 9,771 main interviews, 8,273 core members were invited to participate in the life history interview; of those 7,855 individuals completed the life history interview (NatCen 2009).

3.2.1.2 Wave 4 sample (2008/2009)

The wave 4 initial sample contains 11,050 completed main interviews, including 6,623 cohort 1 core members (59.9% of the wave 4 sample) and 972 cohort 3 core members

(8.8%). Additionally, this wave also included a refreshment sample, to represent the youngest group (50-51 years old) and to top-up the group aged 53-74 to compensate for previous attrition. The refreshment sample included 2,291 individuals classified as cohort 4 core members (C4CM) (20.7% of the wave 4 sample), who were selected from HSE 2006 and were between 50-74 years old at wave 4. Finally, the wave 4 initial sample also included 1,164 core partners (10.5%) (Figure 3) (Cheshire et al. 2012).

Wave 4 core members were asked to participate in a nurse visit; at wave 4 8,643 nurse visits were conducted.

3.3 Variables

3.3.1 Outcomes

Five outcomes were used in this study. The considerations for selection of the outcomes were already described on section 1.1.2. Furthermore, these diverse health outcomes assess a spectrum of different dimensions of health. Two of them are indicators of self-perceived recent health status: self-rated general health and self-rated oral health. The third is an indicator of long-term oral health status and accumulation of disease: total tooth loss. The fourth is an indicator of quality of life: oral impacts on daily performance. Lastly, the fifth is a clinical measure of physical function: grip strength.

3.3.1.1 Adult self-rated general health (SRH)

Self-rated general health is a widely used indicator of overall health. It is considered as a holistic measure of health that captures aspects of physical, mental and social well-being (Idler & Benyamini 1997). There have been some studies suggesting that self-rated general health is more a reflection of long-standing chronic conditions rather than acute transitory and less severe conditions (e.g. dislocations and sprains) (Goldstein et al. 1984; Pope 1988).

Furthermore, some authors have mentioned that self-rated general health might also capture conditions that are yet undiagnosed (Giltay et al. 2012).

Self-rated general health has been shown to be a predictor of mortality (Kaplan & Camacho 1983; Lee 2000), and has been associated with functional ability (Idler & Kasl 1995), morbidity (Chandola & Jenkinson 2000a), health care utilization (Chamberlain et al. 2014) and recovery from illness (Wilcox et al. 1996).

Self-rated general health was assessed in the main questionnaire by a single question:

“Would you say that your health is...?” The five possible answers were:

1= very good
2=good
3=fair
4=bad
5=very bad

Following the suggestion by Manor et al. (2000), the five categories were dichotomized into those who reported having very good/good health (a clearly positive perception of health) against those reporting fair/bad/very bad health. Manor et al. (2000) showed that the association between self-rated general health and SEP was very similar whether a binary or a 5-category self-rated health variable was used.

3.3.1.2 Adult self-rated oral health (SRoH)

Self-rated oral health is a valid indicator of overall oral health status (Gilbert et al. 1998; Ramos et al. 2013); particularly at older ages (Matthias et al. 1995). Self-rated oral health reflects individuals’ perception of current oral health status and has been widely used in surveys and international studies, being an indicator of recent rather than historical oral health status.

Evidence has shown that self-rated oral health correlates with clinical measures such as tooth loss, dental pain, need of prostheses, untreated caries and reduced functional ability (Benyamini et al. 2004; Pattussi et al. 2007; Pattussi et al. 2010).

Moreover, it has been suggested that self-rated oral health is a multidimensional assessment of clinical and subjective oral health status. Rather than being a measurement of oral disease, it provides information about how oral diseases affect individuals' lives (Benyamini et al. 2004). Oral health can have an important impact on self-rated general health and on quality of life. Oral diseases can cause pain, eating disorders, sleeping problems, communication problems, social disability and low self-esteem. Accordingly, self-rated oral health has been associated with future levels of self-rated general health (Benyamini et al. 2004). Furthermore, it has been independently associated with life satisfaction (Locker et al. 2000; Benyamini et al. 2004).

Self-rated oral health was assessed by a single question:

"Would you say that your dental health is?" The five possible answers were:

1= excellent
2=very good
3=good
4=fair
5=poor

Following the convention used in previous studies (Sabbah et al. 2007; Tsakos et al. 2011; Rouxel et al. 2015), the variable was dichotomized into those who reported having poor/fair oral health against all others.

3.3.1.3 Total tooth loss

Self-reported total tooth loss is a robust measure of edentulousness (Gilbert et al. 2002; Pitiphat et al. 2002). It is also a broad measure of accumulation of oral disease and dental treatment throughout the life course, being a common endpoint of several dental diseases (Gilbert et al. 2002).

Total tooth loss has been associated with dietary intake (Hung et al. 2005), higher prevalence of chronic conditions such as diabetes (Medina-Solís et al. 2006) or obesity (Österberg et al. 2010), sleep disorders (Bucca et al. 2006), functional limitations (Avlund et al. 2001; Emami et al. 2013), social impairment (Heydecke et al. 2005) decline of psychosocial well-being (Naik & Pai 2011) and mortality (Holm-Pedersen et al. 2008). However, it has also been associated with positive perception of oral health (Atchison & Gift 1997; Slade & Sanders 2011).

Total tooth loss was assessed by a single question:

"In relation to dental health, which of the following applies to you"; with four possible answers:

1=no natural teeth and wears denture

2=both natural teeth and denture

3=only natural teeth

4=neither natural teeth nor dentures

The four categories were dichotomized into dentate (reported only natural teeth/both natural teeth and denture) against edentate (no natural teeth and wearing denture/neither natural teeth nor denture) following the approach adopted by Tsakos et al. (2011) and Rouxel et al. (2015).

3.3.1.4 Oral impacts on daily performances (OIDP)

The OIDP is a validated measure of oral health-related quality of life among adult and older adult populations (Adulyanon & Sheiham 1997; Tsakos et al. 2001). It measures the impact of oral diseases on daily activities. OIDP was theoretically based on a modification of the

WHO's International Classification of Impairments, Disabilities and Handicaps framework as adapted for oral health (Locker 1988).

OIDP measures how oral disease impacts on the quality of life of respondents in terms of difficulties with eight basic activities of daily life: eating, speaking, cleaning teeth, sleeping and relaxing, smiling and laughing, maintaining usual emotional state, carrying out work and social role and enjoying contact with people (Adulyanon & Sheiham 1997).

ELSA's OIDP is a simplified version, including five commonly reported impacts. However, the original OIDP index assesses frequency and severity, while ELSA's OIDP only assess prevalence of impacts on daily activities.

Oral impacts on daily activities was assessed by a single question:

"In the past six months, have any problems with mouth, teeth or dentures caused you to have any of the following?" There were six possible answers:

> 1=difficulty eating food
>
> 2=difficulty speaking clearly
>
> 3=problem with smiling, laughing and showing teeth without embarrassment
>
> 4=problems with emotional stability, for example, becoming more easily upset than usual
>
> 5=problems enjoying the company of other people such as family, friends and neighbours
>
> 6= none of these

The six categories were dichotomized into those who reported experiencing at least one of the aforementioned oral impacts (categories 1 to 5) against those who reported no oral impact on daily performance (category 6=none of these).

3.3.1.5 Grip strength

Grip strength is an objective and quantifiable measure of physical function, that is the functional capacity of an individual to undertake everyday tasks. Moreover, it is the most widely used measure of physical function (Cooper et al. 2011).

There is strong evidence showing that clinical measures of physical function, such as grip strength, not only give a measure of physical functioning, but also, can be used as markers of current health and predictors of future health (Cooper et al. 2011). In fact, grip strength is a good indicator of overall strength and is correlated with functionality of other muscle groups (Rantanen et al. 1994). Additionally, it has been associated with mortality (Laukkanen et al. 1995), functional decline (Rantanen et al. 1999; Shinkai et al. 2003) and future disability (Al Snih et al. 2004).

Grip strength was measured at the nurse visit in ELSA by asking the individual to stand up and hold a dynamometer squeezing the handle with maximum force. Those who were unable to stand up remained seated. Three measures were recorded for each hand, the maximum valid measurement recorded from the dominant hand was considered for the analysis.

Grip strength was used as a continuous variable measured in kilograms.

3.3.2 Main explanatory variable: social trajectories

Occupational social class was used as the indicator of socioeconomic position (SEP).

Socioeconomic position is a multifactorial concept that involves both resource and prestige measures (Krieger et al. 1997). Occupational class is a widely used measure of socioeconomic position. Occupation has been recognized as an indicator of material and social resources that allows placing individuals within a social hierarchy (Grusky & Cumberworth 2010); it has been associated with earnings, sense of control, housing, access to goods and lifestyles (Rose & O'Reilly 1998; Marmot et al. 1991; Ross 2000). The theoretical basis is that certain occupations share common social positions within a society determining individuals life chances (Krieger et al. 1997; Galobardes et al. 2006).

Socioeconomic position was assessed at two time points based on the availability of data: these time points are SEP in childhood and SEP in adulthood. ELSA's design does not allow assessing intergenerational changes on socioeconomic position at more time points. The only socioeconomic position measure available at childhood is father's occupation. Moreover, at adulthood a considerable fraction of the sample was retired (about 60%), not allowing to considered occupation at later waves.

Even so, Stone et al. (2014) showed that two time points can be enough to reveal important associations between social trajectories and later health; a larger number of data-points does not necessarily produce a better summary of life course occupational social class.

SEP at both time points -at childhood and adulthood- was categorised into three groups. These 3 categories at two time points were used to build nine social mobility trajectories groups. These groups are described later in this chapter.

3.3.2.1 Childhood SEP: parental occupational socioeconomic position

Parental occupation has been widely used as a marker of childhood SEP. The reliability of retrospective reports of parental occupational SEP has been previously shown, studies have demonstrated that retrospective parental occupation could be accurately recalled in later adulthood (Berney & Blane 1997; Breen & Jonsson 1997).

The main questionnaire assessed childhood SEP through the question: "What was your father's main occupation when you were 14?" Respondents were requested to classify their father's occupation within 19 categories:

1. Armed forces
2. Manager or senior official in someone else's business
3. Running his own business
4. Professional or technical
5. Administrative, clerical or secretarial
6. Skilled trade
7. Caring, leisure, travel or personal services
8. Sales or customer service
9. Plant, process or machine drivers or operators
10. Other jobs
11. Something else
12. Casual jobs
13. Retired
14. Unemployed
15. Sick / disabled
16. Don’t Know
17. Not applicable
18. Refusal
19. Lived in children’s home

When the father was absent, individuals were asked to report the main occupation of the principal carer. At wave 3 and wave 4, 9% of respondents (w3n=896; w4n=1015) reported living during their childhood with a main carer different than their father during their childhood.

Additionally, where parental occupation was classified as not applicable at waves 3 or 4, information on parental occupation was complemented with data from previous waves.

Childhood SEP was categorised into three groups (Table 2):

High SEP (Managerial, professional, technical, own business), middle SEP (administrative, clerical and secretarial, skilled trade, service sector), and low SEP (manual occupations, casual jobs, unemployed, sick or disabled and lived in children's home). Participants with parental occupation classified as armed forces, retired, refusal, not applicable, unknown, something else or other were treated as missing values because these categories do not follow a hierarchical relationship with the other categories and there is no straightforward way to include them in this ordinal SEP measure.

Table 2. Childhood SEP classification

HIGH	Managerial or senior official
	Running his own business
	Professional or technical
MIDDLE	Administrative, clerical or secretarial
	Skilled trade
	Caring leisure, travel, personal services
	Sales or customer service
LOW	Plant, process or machine drivers
	Casual job
	Something else
	Unemployed
	Sick/disabled
excluded	Armed forces
	Other jobs
	Retired
	Don't know
	Not applicable
	Refusal

The criteria to decide how to classify the paternal occupation in each of the three categories are described in detail in Appendix A. The aim was to classify parental occupation in a way that was as similar as possible to the NS-SEC scheme used for adult SEP. Therefore, the Office for National Statistics NS-SEC socioeconomic classification guideline and the SOC2010/SOC2000 guidelines were used (ONS, 2010a; ONS, 2010b; Rose & Pevalin 2010).

3.3.2.1 Adult SEP: occupational socioeconomic position

The main questionnaire assessed adult SEP through a question about current occupation. Retired participants were classified according to their last occupation. Research has demonstrated that classifying retired individuals by their last occupation is a relevant option, even for those who have been retired for several years (Grundy & Holt 2001).

Current or most recent occupation was classified using the UK National Statistics Socioeconomic Classification scheme (NS-SEC). The NS-SEC is a validated occupation based socioeconomic classification schema, known as a modern way of showing the structure of SEP (Rose & O'Reilly 1998). NS-SEC considers social class as a concept of social relations within the labour market. Therefore, changes through time on the composition of occupational classes on specific kind of jobs are not relevant as the employment relationships remain the same (ONS 2010; Bukodi et al. 2015).

The NS-SEC was designed taking into account job security, prospect of economic advance, control over work, autonomy and degree of responsibility for supervision of others (ONS, 2016) . NS-SEC is conceptually clearer than previous occupational classifications because we know what NS-SEC is measuring: employment conditions and relations, allowing to construct causal narratives explaining how SEP relates to different outcomes (Chandola & Jenkinson 2000b). In addition, according to Goldthorpe (2016) NS-SEC is strongly correlated with material factors such as income level.

The NS-SEC conceptual model has three versions according to the number of categories of classification: eight, five or three categories. Appendix B describes the nested relationships between these versions.

This study used the three-category NS-SEC. Individuals classified as “other”, “not applicable” or “incomplete” were account as missing values because these categories cannot be hierarchically classified within the other categories (Table 3).

Table 3. Adult SEP classification: NS-SEC 3 class scheme

HIGH	Higher managerial, administrative and professional occupations
MIDDLE	Intermediate occupations
LOW	Routine and manual occupations
excluded	Other, not applicable, no information

Adult SEP was assessed through the highest occupation in the household, mainly because an individual occupation-based SEP approach may not be fully representative of the genuine SEP of women. The household and caring roles often undertaken by women can result in women being unemployed or having an occupation that does not reflect their household SEP, and therefore the status they are able to draw upon, especially if those women are cohabiting with men in higher SEP. To take this into account, this thesis used household SEP instead of individual SEP. A household approach recognizes that occupational SEP is to some extent “transferable”, this means that SEP of one individual can be used to characterize the SEP of other family members (Galobardes et al. 2006). Therefore, in this study if two individuals were sharing a house, and one of them was classified within low adult SEP and the other within high SEP, both were classified at high SEP. This approach is also known as the “dominance method” (Grundy & Holt 2001) allowing women to be considered as the household reference person if they were classified in a higher SEP than men. Additionally, this approach is justified on the basis that a household SEP approach is related to larger health inequalities and also greater differentiation in mortality than an individual SEP approach (Koskinen & Martelin 1994; Sacker et al. 2000).

ELSA data includes a variable that identifies the household of each respondent; therefore, participants that lived together share the same household variable number. The wave 3 analytical sample comprised a total of 8,659 individuals living in 5,971 households and wave 4 had a total of 9,805 individuals living in 6,647 households.

3.3.2.2 Social trajectories

Finally, a new variable named social trajectories was created based on a three SEP categories approach considering two time points (childhood and adulthood). As both SEP variables had three categories, the social trajectories variable determined nine possible trajectories:

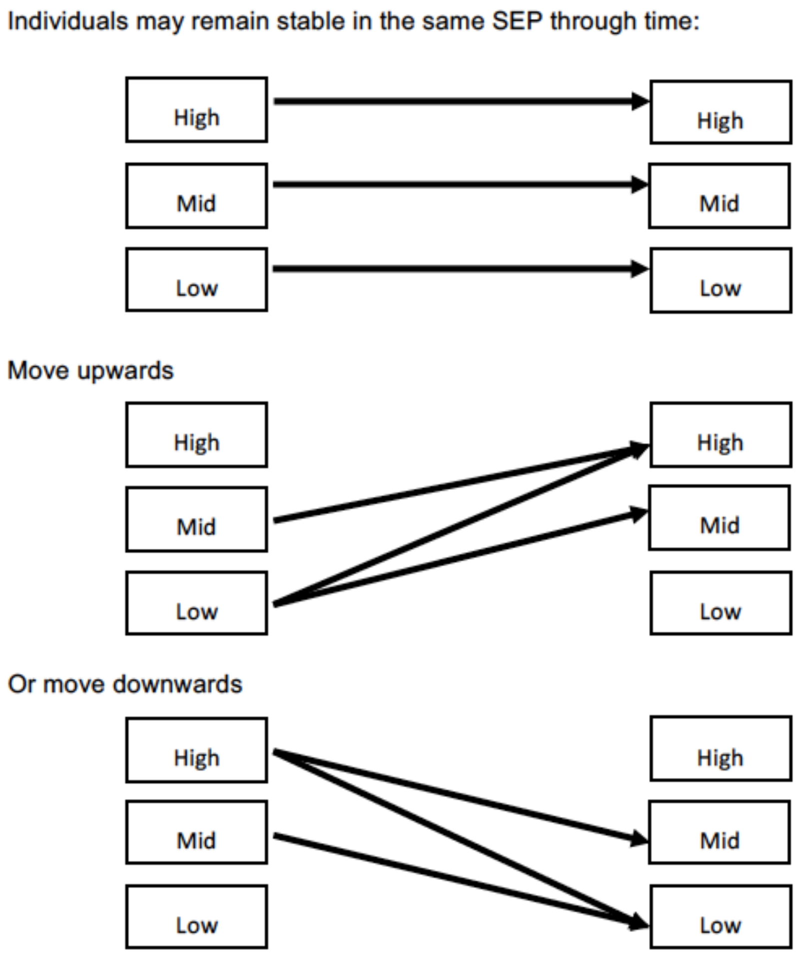


Figure 4. Social mobility trajectories

Resulting in 9 trajectories:

1. Stable High
2. Stable Middle
3. Stable Low
4. Upward mobility from Middle to High
5. Upward mobility from Low to Middle
6. Upward mobility from Low to High
7. Downward mobility from High to Middle
8. Downward mobility from Middle to Low
9. Downward mobility form High to Low

3.3.3 Mediators

As the framework illustrated in Figure 2 shows, in this study education and health related behaviours have been proposed as mediating factors between social mobility and adult health.

3.3.3.1 Educational level

As discussed previously, education has been recognized as a relevant factor determining social mobility (Erikson & Goldthorpe 2002).

Educational attainment was collected in the main questionnaire according to the highest qualification achieved in a seven-category question:

1= NVQ4/NVQ5/Degree or equivalent

2=Higher education below degree

3=NVQ3/GCE A-level equivalent

4=NVQ2/GCE O-level equivalent

5=NVQ1/CSE another grade equivalent

6=foreign/other

7=no qualification

The seven categories were collapsed into three categories: 1=Higher degree or post-secondary qualification (NVQ4/NVQ5/Degree or equivalent, Higher education below degree, NVQ3/GCE A-level equivalent), 2=secondary qualification or other (NVQ2/GCE O-level equivalent, NVQ1/CSE other grade equivalent, foreign/other), 3=no qualifications (Tsakos et al. 2011; Demakakos et al. 2012; Demakakos et al. 2015).

3.3.3.2 Health-related behaviours

Two health-related behaviours were considered: smoking and physical activity. These two behaviours were chosen based on the availability of the data. However, these two behaviours have been repeatedly associated with the outcomes of this study. Smoking has been recognized as a risk factor for poor general and oral health (World Health Organization 1997; Petersen et al. 2005). Additionally, it has been directly associated with total tooth loss (Osterberg & Mellström 1986; Locker 1992). Physical activity has been found to be associated with grip strength. Kuh et al. (2002) even mentioned that physical activity is "*the major environmental correlate of muscle strength during adult life*". Moreover, physical activity has been recognized to influence quality of life on older adults and perceived general health (Rejeski & Mihalko 2001).

Although the relationship between physical activity and oral health outcomes is not straightforward, and the relationship between smoking and grip strength is not fully understood (Kok et al. 2012), these behaviours can be used as proxy measures of lifestyle. Behaviours tend to cluster and this includes behaviours related to oral and general health (Singh et al. 2013). For instance, it can be expected that someone that is physically active and does not smoke is also concerned about being healthy regarding other behaviours such as oral hygiene. In fact, smoking has been associated with alcohol consumption (Grant et al. 2004), dietary intake (MartinezGonzalez et al. 1997), daily tooth brushing (Ojima et al. 2007) and physical fitness (Conway & Cronan 1992); and physical activity has been previously associated with diet (Fransen et al. 2017) and with dental and general health check-ups (Al-Isa et al. 2011).

Smoking was measured by two questions combined and coded as a categorical variable (current smoker, ex-smoker and non-smoker). Physical activity was measured by three questions combined and coded as a binary variable: physically active (taking part in physical activities at least once a week) and physically inactive (taking part in physical activities less than once a week/not taking part in physical activities).

3.3.4 Confounders

3.3.4.1 Age

Age was categorised in three groups reflecting different life-stages: 50 to 64 years old, when most individuals are still working; 65 to74 years old, when most individuals are retired but still physically active; and 75 years old and over, when many individuals need some support as a consequence of health problems (Breeze & Stafford 2008).

3.3.4.2 Gender

Gender has been associated with all the outcomes used in this thesis and with SEP trajectories. Participants were classified as men and women.

3.3.4.3 Childhood self-rated general health

Childhood health has been proposed to influence social mobility directly (Nunn et al. 2008); and indirectly as a mediating factor in the association between childhood SEP and adult health (Blanden et al. 2007).

Childhood health was assessed at wave 3 in the life history interview. Participants were asked: "Please rate your health before age 16", with five possible answers:

1= excellent

2=very good

3=good

4=fair

5=poor

The five categories were dichotomized into those who reported having poor/fair health against excellent/very good/good childhood health.

Being this a sample that includes a wide range of ages, it is important to notice that a potential limitation of collecting childhood health data retrospectively might be that recall capacity might decrease with age. Additionally, younger cohorts might report prevalence of childhood health differently because of improvements in the diagnosis of diseases. However, Smith (2009) demonstrated that elderly individuals remember their childhood events very accurately despite their current age.

3.3.4.4 Employment status

Researchers such as Ross & Mirowsky (1995) recognized that employment status influenced health reports. Economically active individuals are more likely to report better health and better physical performance (Ki et al. 2011; Hurst et al. 2013) than their economically inactive peers.

Employment status was measured in the main questionnaire. Participants were asked to report the best description of their current situation, with eight possible answers:

1=retired

2=employed

3=self-employed

4=unemployed

5=permanently sick or disable

6=looking after home or family

7=semi-retired

8=other

The response options were categorised into three groups: employed (employed, self-employed, semi-retired), retired, and other inactive (unemployed, permanently sick or disable, looking after home or family, other).

3.3.4.5 Marital status

Marital status has consistently been associated with individuals' health in adult populations. Moreover, differentials in marital status persist after retirement. Literature has identified that unmarried individuals are more prone to rate their health poorer and have poorer oral health than their married peers at older ages (Sabbah et al. 2011). Also, men are more affected by marital status than women; being married seems to be a stronger protective factor for men than women. Moreover, it has also been shown that changes in marital status, such as divorce, may have an effect on health (Robards et al. 2012). This is especially relevant for this sample that it is in the life-stage when a significant percentage of respondents can be expected to become widowed and therefore lose the emotional, social and financial support that a partner gives.

Marital status was collected in the main questionnaire with participants asked to report their current legal marital status, resulting in six answers:

1=married including civil partnership

2=cohabiting

3=single or never married

4= widowed

5=divorced

6=separated

The response options were categorised into four groups: married (married or civil partnership, cohabiting) single, separated (separated, divorced) and widowed.

3.4 Statistical analysis

The statistical analysis can be divided in three sections. The first section describes how missing data were handled, and describes the procedure used to obtain the analytical samples. The second section is based on regression models mainly exploring the associations between intergenerational social mobility trajectories and general health, oral health and physical function. The third section explores the degree of contribution of both social mobility theories –social causation and health selection- on the associations between intergenerational social mobility and adult health and function using structural equation modelling.

3.4.1 Handling missing data: multiple imputation

Many of the variables used in this analysis include categories that could not be classified, categories such as: not applicable, don’t know or other. These answers were classified as missing data.

3.4.1.1 Missing data at wave 3

The highest missing percentage was observed for childhood self-rated general health presenting a missingness of 19.9% and for childhood SEP presenting missingness of 19%, explained mostly for the category “other occupation” representing a 14.9% of the missing data on childhood SEP. The rest of variables had missingness equal or less than 5%. Gender and age had no missing data (Table 4).

Among the 9,771 initial individuals at wave 3, 3,540 (36.2%) individuals had missing data on at least one of the variables.

Table 4. Distribution of missing data at wave 3 (%)

	w3 n=9771
Self-rated Health	2.4
Self-rated Oral Health	0.1
Total tooth loss	0.1
Oral impacts on daily performance	2.4
Education	0.4
Adult SEP	2.5
Child SEP	19.0
Subcategories excluded child SEP	
Other	14.9
Not app or Don't know	0.4
Armed Forces	2.6
Retired	0.7
Not answered	0.4
Smoking	<0.1
Physical activity	<0.1
Employment status	<0.1
Marital status	<0.1
Childhood self-rated health	19.9

To observe if there was a common pattern among those individuals with missing data on this study, bivariate logistic regression analyses were conducted testing the association between missingness and socioeconomic position, covariates, behaviours and outcomes.

Table 5 displays the information of the bivariate regressions. The regression analyses suggested that missing observations at wave 3 were associated with older age and low SEP at childhood. Also, a linear association with adult SEP and educational level was found. The missingness increased as the educational level and adult SEP decrease. Moreover, missing observations were also associated with being retired or economically inactive, being widowed, being physically inactive and smoke. Furthermore, missingness was higher in those individuals reporting poor adult general health, poor adult oral health, total tooth loss and poor childhood health ($p<0.05$).

Table 5. Distribution of missingness and logistic regression testing association between missing data and socio-demographic characteristics, outcomes and behaviours at wave 3
Wave 3 n=9771
Individuals with missing data w3 n=3540 (36.2%)

	n	% with missing data	OR(95%CI)
Gender			
Men	4295	36.6	1
Women	5476	35.9	1.02 (0.93, 1.11)
Age group			
50 to 64	4919	33.6	1
65 to 74	2371	35.6	1.13 (1.01, 1.26)*
74+	2053	42.3	1.53 (1.36, 1.71)**
Childhood SEP			
High	2475	20.0	1
Middle	3693	20.6	1.08 (0.94, 1.25)
Low	1751	24.6	1.33 (1.12, 1.57)*
Adult SEP (household SEP)			
High	4170	29.0	1
Middle	2409	34.2	1.29 (1.15, 1.45)**
Low	2952	43.0	1.88 (1.69, 2.10)**
Education			
High degree	3933	29.2	1
Secondary qualification	2980	34.6	1.28 (1.14, 1.43)**
No qualification	2815	46.8	2.19 (1.96, 2.44)**
Employment status			
Employed	3747	33.5	1
Retired	4580	36.9	1.30 (1.17, 1.43)**
Other inactive	1440	40.8	1.44 (1.25, 1.66)**
Marital status			
Married	6541	35.7	1
Single	574	35.5	1.12 (0.92, 1.36)
Separated	1083	34.7	1.01 (0.87, 1.17)
Widowed	1572	39.8	1.29 (1.14, 1.45)**
Self-rated Health			
Good health	6537	32.0	1
Poor health	2997	40.4	1.46 (1.32, 1.60)**
Self-rated Oral Health			
Good oral health	7964	35.3	1
Poor oral health	1800	39.9	1.26 (1.12, 1.42)**
Total tooth loss			
Dentate	8203	34.6	1
Edentate	1562	44.5	1.56 (1.39, 1.76)**
Oral Impacts			
No impact	8957	24.4	1
Impact	578	38.4	1.21 (1.00, 1.46)
Childhood health			
Good health	6893	19.9	1
Poor health	933	24.2	1.25 (1.05, 1.49)*
Smoking			
Never smoker	3768	34.9	1
Ex-smoker	4485	35.8	1.03 (0.93, 1.14)
Smoker	1509	40.5	1.21 (1.05, 1.39)*
Physical activity			
Active	8597	34.4	1
Non-active	1172	49.7	1.88 (1.64, 2.16)**

*Percentages un-weighted; n=number of individuals; % with missing data= percentage of individuals with at least one missing value within that group; OR (95% CI)= odds ration (95% Confidence intervals);*p-value <0.05; ** p-value <0.001*

3.4.1.2 Missing data at wave 4

The highest percentage of missing data was observed for childhood self-rated general health presenting a missingness of 37.2%, for grip strength presenting a missingness of 23.8% and for childhood SEP presenting missingness of 19%, explained mostly for the category "other" representing a 14.7%. The rest of the variables had missingness equal or less than 5%. Gender and age had no missing data (Table 6).

Among the 11,050 initial individuals at wave 4, 6,507 (58.9%) individuals had missing data on at least one of the variables.

Table 6. Distribution of missing data at wave 4 (%)

	w4 n=11050
Grip strength	23.8
Education	3.3
Adult SEP	5.1
Child SEP	19.0
Subcategories excluded child SEP	
Other	14.7
Not app or Don't know	0.3
Armed Forces	2.6
Retired	0.7
Not answered	1.0
Smoking	0.7
Physical activity	0.1
Employment status	0.1
Marital status	<0.1
Childhood self-rated health	37.2

Table 7 present the descriptive information of the bivariate regressions. Missing observations at wave 4 were associated with younger age, low adult SEP, no educational qualifications, being employed and economically inactive, being separated, having poor childhood general health, being physically inactive and smoking ($p<0.05$).

Table 7. Distribution of missingness and logistic regression testing association between missing data and socio-demographic characteristics and behaviours at wave 4
Wave 4 n=11050
Individuals with missing data w4 n=6507 (58.9%)

	n	% with missing data	OR(95%CI)
Gender			
Men	4925	58.5	1
Women	6125	59.2	1.05 (0.96, 1.14)
Age group			
50 to 64	5571	60.5	1
65 to 74	3047	57.2	0.92 (0.84, 1.01)
74+	2131	53.5	0.72(0.64, 0.80)**
Childhood SEP			
High	2914	50.2	1
Middle	4126	48.0	0.93 (0.84, 1.04)
Low	1910	50.4	0.97 (0.85, 1.10)
Adult SEP (household SEP)			
High	4788	54.6	1
Middle	2613	53.5	0.97 (0.87, 1.08)
Low	3085	62.6	1.41 (1.27, 1.56)**
Education			
High degree	4468	52.9	1
Secondary qualification	3234	55.3	1.10 (1.00, 1.22)
No qualification	2979	66.7	1.74 (1.56, 1.93)**
Employment status			
Employed	4047	61.8	1
Retired	5543	54.6	0.81 (0.74, 0.89)**
Other inactive	1447	67.0	1.34 (1.25, 1.66)**
Marital status			
Married	7510	59.0	1
Single	675	61.0	1.13 (0.95, 1.35)
Separated	1231	60.2	1.23 (1.08, 1.41)*
Widowed	1632	56.4	1.00 (0.87, 1.12)
Max grip strength			
Continuous grip strength (0 to 99 kg)	2628	23.8	0.12 (-0.39, 0.62)
Childhood health			
Good health	6087	34.0	1
Poor health	839	37.5	1.19 (1.01, 1.41)*
Smoking			
Never smoker	4316	58.7	1
Ex-smoker	4963	55.5	0.88 (0.80, 0.96)
Smoker	1545	64.4	1.32 (1.15, 1.51)*
Physical activity			
Active	9609	57.5	1
Non-Active	1429	68.1	1.49 (1.30, 1.69)**

*Percentages un-weighted; n=number of individuals; % with missing data= percentage of individuals with at least one missing value within that group; OR (95% CI)= odds ration (95% Confidence intervals);*p-value <0.05; ** p-value <0.001*

Adopt a complete case analysis approach to handling missing data might bias the estimates. For instance, the prevalence of disease, the proportion of individuals from lower socioeconomic position and the proportion of individuals with lower levels of education would be underestimated. Moreover, the exclusion of 36.2% of the sample at wave 3 and 58.9% at wave 4 would reduce the statistical power of the analysis.

Therefore, to account for missing data and use all the information that respondents provided, multiple imputation was conducted. Multiple Imputation is an approach that replaces missing values with estimates based on the observed data, accounting for uncertainty about the predicted values. Using the available information, multiple data sets are created; these data sets contain the same observed values but different imputed values.

Multiple imputation was conducted with the assumption that missing values were missing at random (MAR). It was assumed that missingness depends on the observed data, but not on the missing data itself, in other words, observed variables should completely explain why observations are missing. Even when MAR might be unlikely, in large samples, imputation is at least as good as listwise deletion even when the assumption of missing at random is violated (Graham 2009, p. 559). Actually, simulation studies showed that in large samples the assumption of MAR leads to reliable estimates, even when there is a substantial amount of missing data (Collin et al. 2001; Johnson & Young 2011). Furthermore, these studies suggested that multiple imputation is superior to listwise deletion on the estimation of standard errors and accuracy of significance tests.

Missing values were imputed using the software ICE in Stata SE 14.2. The used method was the “chained equation” approach, also known as “fully conditional specification” approach. This approach uses a set of regression equations to estimate the missing values. Binary variables were estimated using logistic regression, categorical variables were estimated using multinomial logistic regression and ordered categorical variables were estimated using ordered logistic regression.

A subset of auxiliary variables was included in the previous imputation. These auxiliary variables were not used within the analysis but were associated with the non-responses at wave 3 and wave 4 or are correlated with the analysis variables (Scholes et al. 2009; Cheshire et al. 2012). The variables are: ethnicity, limiting longstanding illness, tenure, type of household, institutional interview and principal carer at childhood. Researchers have found that the inclusion of auxiliary variables on the imputation model produce more accurate estimates and also increase the probability of meeting MAR assumptions (Collin et al. 2001; Graham 2009).

The number of imputations performed was sixty. This number was chosen based on that literature usually suggested a minimum of five imputed datasets to take uncertainty into account, but a higher number of imputed dataset can improve the stability of the estimates (Graham 2009). White et al. (2011) recommend that the number of datasets should be at least equal to the percentage of incomplete cases when the percentage of missing data is large. The imputation was informed by the all the variables used in the analysis and some auxiliary variables already mentioned. The number 54321 was set as a random-number seed for reproducibility.

The estimates of the sixty datasets were pooled using the “MI” Stata command. A new imputed complete data set was created for each wave (wave 3 and wave 4).

Appendix C display the trace plots of the predicted mean and standard deviation values of all sixty imputations on the variables with the highest missing percentages, showing that the values vary randomly.

3.4.1.3 Wave 3 analytical sample: general and oral health

The imputed-complete data set was used to derive the wave 3 analytical sample. After imputation, inclusion/exclusion criteria were applied. First, only core members were included in the analysis. Second, participants who had moved into institutions were excluded. Third, only participants aged 50 and over were included. Hence, 1,112 individuals were excluded from the analysis (11.4% of the initial sample), resulting in a wave 3 analytical sample of 8,659 individuals (Figure 5).

From these 8,659 individuals, 98,5% of the interviews were carried out on core members and 1.5% on proxy informants if the core member was unable to respond.

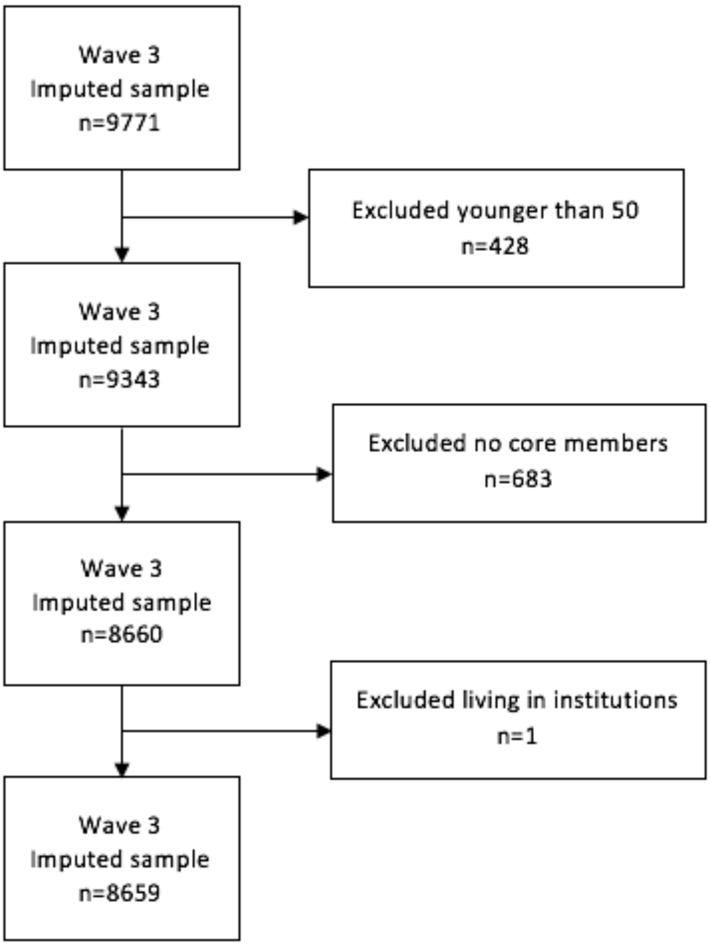


Figure 5. Wave 3 Sampling procedure

3.4.1.4 Wave 4 analytical sample: physical function

To derive the wave 4 analytical sample, the imputed-complete data set for wave 4 was used and the same inclusion/exclusion criteria applied to derive the wave 3 analytic sample was used (Figure 6). Hence, 1,245 individuals were excluded from the analysis (11.3% of the initial sample), resulting in a wave 4 analytical sample of 9,805 individuals.

From these 9,805 individuals, 97,5% of the interviews were done on core members and 2.5% on proxy informants if the core member was unable to respond.

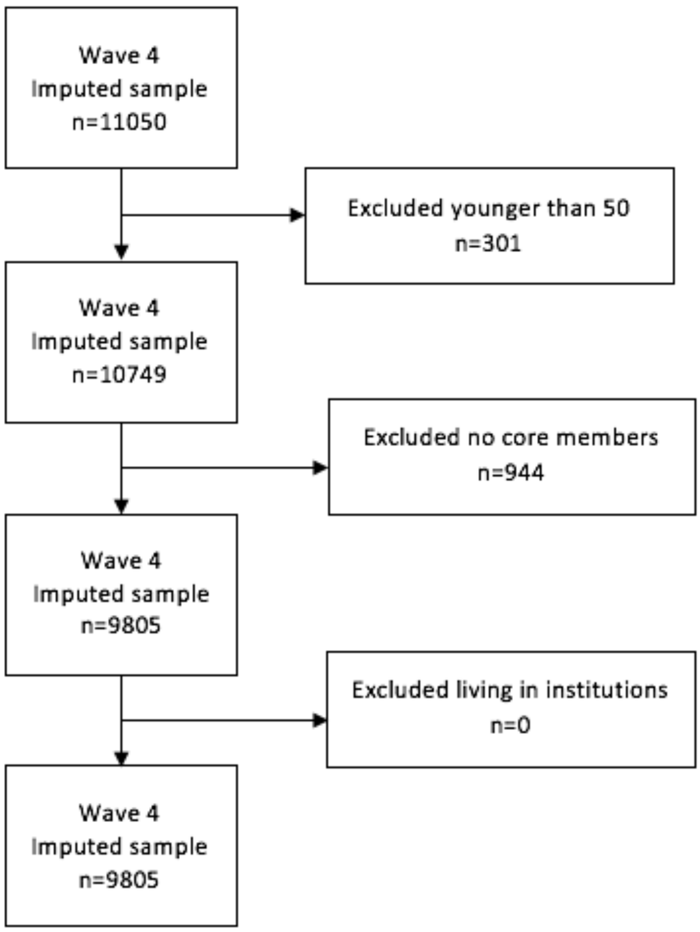


Figure 6. Wave 4 Sampling procedure

3.4.2 Descriptive analyses

A descriptive analysis was conducted with two aims. First, to understand the prevalence of intergenerational social mobility of ELSA's sample. Second, to observe if the socio-demographic characteristics differed by mobility trajectory groups. This section aimed to address the first objective of this thesis: "*describe the prevalence of intergenerational social mobility trajectories in the population aged 50 years and over living in England"* and *"describe the socio-demographic characteristics associated with each social mobility trajectory group*".

Therefore, the frequency distribution of the social trajectories, socio-demographic characteristics and behaviours were examined. In addition to the analyses for wave 3 and wave 4, data for men and women were also analysed separately. Additionally, the distribution of social trajectories was explored via cross-tabulation with every explanatory variable. Test for trend and Pearson x^2 test (when appropriate) were performed to check whether socio-demographic characteristics were linearly related to social trajectories.

Additionally, the correlation between oral health-related outcomes was examined to understand if the oral health outcomes are related to each other.

The information is reported as weighted percentages to describe the population-based estimates and to correct for the effect of non-response and the complex survey design.

3.4.3 Regression analyses

Regression models were used to explore the association between social mobility trajectories and health, oral health and physical function. The regression analyses aimed to address the second and the third objectives of this thesis: "Explore *the associations between intergenerational socioeconomic trajectories and adult general health and oral* *health"* and *"Explore the associations between intergenerational social mobility trajectories and physical function".*

Logistic regression models were used to estimate the association between social trajectories and each dichotomous outcome: self-rated health, self-rated oral health, oral impacts on daily performance, and total tooth loss. To estimate the association with the continuous outcome (grip strength) linear regression models were used. The measure of grip strength was slightly positively skewed and had positive kurtosis, but did not deviate considerably from the pattern of normal distribution (Appendix D).

Analyses were performed using the statistical software: STATA version 14.2.

The STATA "svy" command containing the cross-sectional weights was used throughout the analysis.

Odds Ratios (OR) for logistic regression and coefficients (Coef) for linear regressions are reported with 95% confidence intervals. Statistical significance of the unadjusted and adjusted associations was defined at the 0.05 level. The stable high group was used as the reference group for the social mobility variable because it is expected to be the trajectory group with the lowest risk of poor health, oral health and low grip strength.

The first step of the analysis tested the unadjusted association between each outcome and the main explanatory variable. This model was called Model 1 or initial model.

- Model 1: Outcome +Social trajectories

The second step was to identify confounders in the association between social mobility trajectories and health, oral health and physical function. Therefore, bivariate analyses were conducted between the outcome and every covariate. All variables with a *p*-value equal or below 0.05 were selected to be included into the multiple regression models.

The third step was to explore the associations between social mobility and each outcome adjusted for the covariates. The approach adopted was forward selection: each covariate was added one at a time, thereby testing if the addition of that variable improved the fit of the model and affected the association. The regression results chapter (chapter 5) presents the models with the inclusion of covariates in groups. More detailed results whereby each covariate is added separately (not in groups) into sequential models of adjustment are presented in Appendix F. The groups of covariates presented in this chapter were determined according to the potential pathways and confounders identified through the literature review. First, the constitutive factors were added (gender and age). Second, the variables identified as the principal mediators on the association between SEP and health were also added separately (education and behaviours). Finally, the rest of the variables identified as covariates (employment, marital status and childhood health) were included, resulting in the following set of models:

Model 2: adjusting for gender and age.

- Model 2: Outcome +Social trajectories +Gender +Age

Age was tested separately in its continuous format (age in years) and in its categorical format (age group). The models presented in the results chapter treated age as a continuous variable. However, it might be that there is an age threshold when some of the outcomes significantly deteriorate. Hence, all the models were also tested with age as a categorical variable. Both approaches, continuous age in years and categorical age groups, gave very similar results (Appendix F). Also, owing to the wide age range of the sample and the moderating role of age in the relationship between SEP and each outcome, the significance of interaction of age (in its continuous format) with trajectories was examined (section 5.6.2).

Model 3: additionally included education. Education was added first and alone because was identified by the literature review as one of most influential factors of social mobility and as an indicator of SEP (Erikson & Goldthorpe 2002; Singh-Manoux et al. 2004).

- Model 3: Outcome +Social trajectories +Gender +Age +Education

Model 4: additionally, included behaviours.

- Model 4: Outcome +Social trajectories +Gender +Age +Education +Smoking +Physical activity

Model 5: Full-adjusted model. This model additionally included the covariates identified from the literature review: employment status, marital status and childhood health. This model was called Model 5 or final model.

- Model 5: Outcome +Social trajectories + Gender +Age +Education +Smoking +Physical activity +employment status +marital status +childhood health

3.4.3.1 Stratification and interactions

The final models were stratified by gender, as intergenerational social trajectories and outcomes might differ by gender. Previous studies have shown that grip strength is considerably different between women and men (Kuh et al. 2006) and that women perceived their health and oral health less favourably than men at older ages (Reisine & Bailit 1980; Hunt et al. 1984). Additionally, previous studies have suggested that intergenerational social trajectories may differ by gender, with women more prone to experience intergenerational social mobility than men (Bukodi et al. 2015).

Additionally, as already mentioned, due to the wide age range of the sample, the interaction between age and the intergenerational social trajectories was examined.

Furthermore, the interaction between intergenerational social mobility and total tooth loss (dentate/edentate) was tested for the oral-health related outcomes based on the consideration that the association between SEP and self-rated oral health and oral impacts on daily performance have previously been shown to differ between dentate and edentate individuals in this cohort (Tsakos et al. 2011) .

3.4.3.2 Sensitivity analysis: complete case analysis

A sensitivity analysis was performed to test the differences and similarities on the results when a different approach of dealing with missing data is adopted. Therefore, the regression analysis described on the previous section was replicated using a complete case analysis approach, restricting the analytical sample to only the individuals who had complete data for all variables and met the inclusion/exclusion criteria (only core members aged 50 and over were included in the analysis and participants who had moved into institutions were excluded) (Appendix G).

3.4.4 Structural equation modelling (SEM) analyses

Having explored the association between intergenerational social mobility and general health, oral health and physical function, further analyses were conducted aiming to explore the pathways of these associations. SEM analyses were conducted as a complementary statistical analysis to understand how SEP relates with health and explore a reciprocal association, addressing the fourth objective of this thesis "To assess the size of the contribution of both social mobility theories, health selection and social causation, on the associations between intergenerational social mobility and general health, oral health and physical functioning in older adulthood".

Cross-lagged panel models using SEM were used to assess the contribution of social causation and health selection on the association between health and SEP. This methodology allows estimating the relative effect of health selection and social causation pathways in the same model, thereby permitting to compare which social mobility path has a stronger effect on adult health. Additionally, it is a good way to graphically describe the interaction between pathways (Chandola et al. 2003). Furthermore, SEM takes into account potential errors of measurements in all observed variables (dependent and independent); contrarily to regression analysis, which ignores potential measurement error of the independent variables and might produce misleading results (Raykov & Marcoulides 2006). Figure 7 to 9 illustrate the SEM models and how health selection and social causation were measured; this is further described below in section 3.4.4.2.

3.4.4.1 SEM analysis samples

The same analytical samples used for the regression analyses were used for SEM analyses comprising 8,659 individuals at wave 3 and 9,805 individuals at wave 4.

SEM models were fitted using the software MPlus 7. The sixty imputed datasets generated with Stata SE 14.2 for the regression analyses were imported to MPlus. The “Type=imputation” command was used throughout the SEM analysis. With this command, the estimated parameters and standard errors of each of the sixty imputed datasets are averaged to obtain a single set of estimates.

3.4.4.2 SEM Models

A different SEM model was constructed for each of the five outcome variables. These models included the following variables: childhood SEP, adult SEP, childhood health the potential mediator education and health-related behaviour. All models were adjusted by age, gender, employment and marital status.

The relative contribution of the health selection and social causation paths on the association between social trajectories and health and function was tested by a series of models. First, the direct effect of both social mobility theories was tested without the inclusion of any mediating factor. Therefore, SEM model one included four variables: childhood SEP, adult SEP, childhood health and the adult health or physical function outcome. Figure 7 shows the SEM model. Correlation is illustrated by double headed arrows (e and f). Single headed arrows draw causal paths. The diagonal arrow from childhood SEP to adult health (x) reflects the social causation path; and from child health to adult SEP (y) reflects the health selection path. The size of x and y estimates reflects the magnitude of the effect of both social mobility theories providing the opportunity to determine which one has a stronger effect.

The second SEM model (Figure 8) added education as a mediating factor. Education was added before other variables because it has been recognized as a factor that has an independent effect on adult health (Kawachi et al. 2010) and SEP (Erikson & Goldthorpe 2002). Model 2 estimated the direct effect of both social mobility theories (x for social causation and y for health selection) considering education and the indirect effect of social causation (a1+a2) and health selection (b1+b2) via education. If controlling for education reduced the size of the estimates on the SEP-health paths it would mean that education explained some or all of the SEP-health association.

Finally, a third and fourth model added health related behaviours separately (Figure 9). Estimating the direct effect of both social mobility theories accounting by education and behaviours, and the indirect effect of the different pathways via education and health-related behaviours.

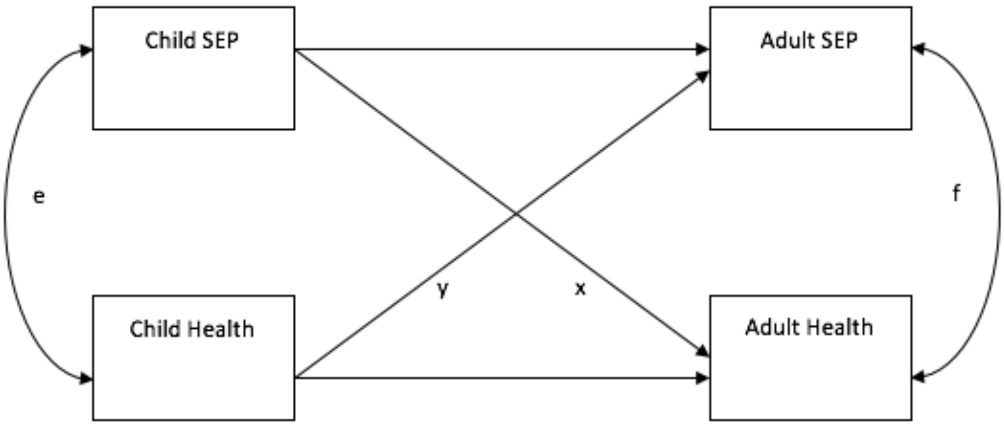


Figure 7. SEM health selection and social causation theories

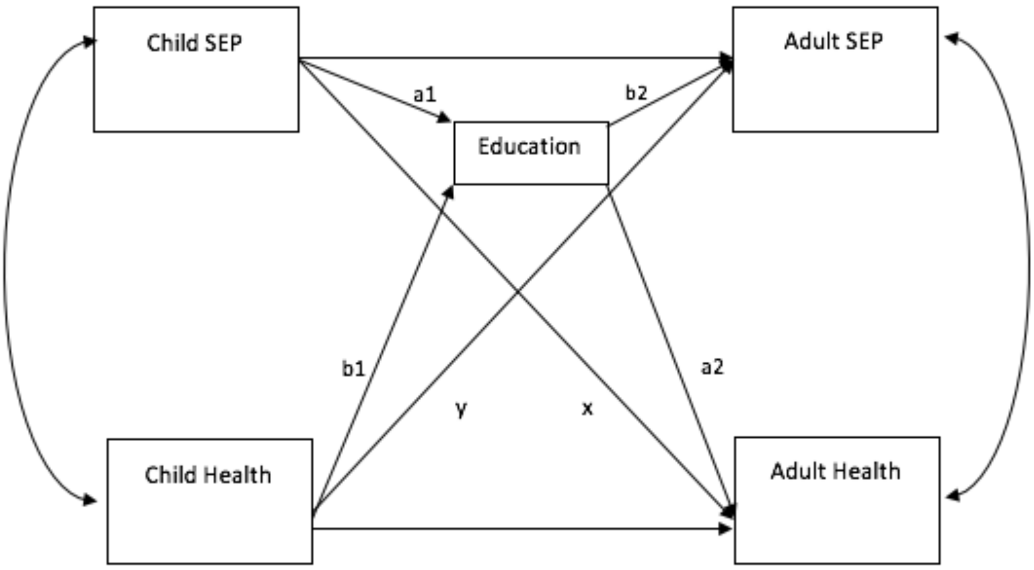


Figure 8. SEM health selection and social causation theories including education as a mediator

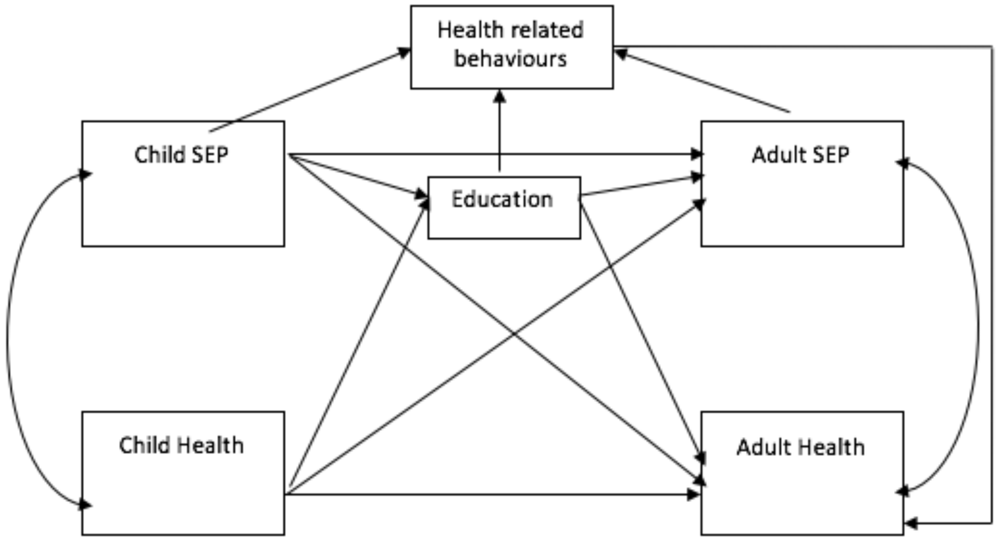


Figure 9. SEM health selection and social causation theories including education and health-related behaviours as mediators

The estimation method used for general, oral health and physical function outcomes was weighted least squares with mean and variance bias correction (WLSMV). WLSMV is a theory-based approach alternative to the maximum likelihood estimation used when the model includes categorical dependent variables. All the SEM models in this study included at least one dependent categorical variable. The use of WLSMV might result in larger standard errors than using maximum likelihood test. Taking this into account, bootstrapping was conducted. Bootstrapped likelihood estimation is an approach suggested by McLachlan & Peel (2000) that allows for a more accurate prediction of error. Therefore, 500 bootstrapped estimations were computed on each dataset.

The chi-squared statistic is extremely sensitive to large sample sizes and cannot be used for WLSMV. Therefore, the root mean square error of approximation (RMSEA) and the comparative fit index (CFI) were used to estimate the model fit. A RMSEA value of 0.05 or lower and a CFI value of 0.95 or higher were defined to indicate a good fitting model (Browne & Cudeck 1993; Kline 2011). Additionally, 15,000 iterations were specified aiming to avoid statistical dependence between datasets (Lee et al. 2010). Also, to facilitate the comparison between both social mobility pathways (x and y) the standardized regression estimates were reported. Lastly, the Wald-test was used to test the significance of the indirect pathways. However, the Wald-test cannot be performed along with bootstrap. Therefore, it was performed without bootstrapping, although the reported standard errors are the ones with bootstrap.

3.4.4.3 Stratification by gender

Based on the results from the regression analysis (chapter 5), the grip strength SEM models were stratified by gender to test if the effect of both social mobility theories differed among men and women.

RESULTS

CHAPTER 4

DESCRIPTIVE ANALYSIS

4 Descriptive analysis

The purpose of this chapter is to describe the wave 3 and wave 4 analytic samples. Analyses in this chapter address the first objective of this thesis, which is: to describe the prevalence of intergenerational social mobility trajectories in the population aged 50 years and over living in England, and to describe the socio-demographic characteristics associated with different social trajectories.

Additionally, this chapter identified the socio-demographic characteristics associated with adverse general health, oral health and physical function in adulthood.

As a first step, the socio-demographic characteristics of both analytic samples, wave 3 and wave 4, were compared by gender. As a second step, the distribution of individuals across social mobility trajectories was described. As a third step, the associations between characteristics and social trajectories, and the associations between characteristics and the outcomes were explored by bivariate regression analyses. In addition, the correlations between oral health outcomes were examined.

4.1 Characteristics of wave 3 and wave 4 analytical samples

Wave 3 and wave 4 analytical samples were obtained after multiple imputation of missing data and applied an inclusion/exclusion criteria (section 3.4.1). As described in the methodology chapter, the ELSA wave 3 initial sample included 9,771 individuals. After applying the inclusion/exclusion criteria, the wave 3 analytical sample comprised 8,659 individuals (section 3.4.1.3). Wave 4 included a refreshment sample covering age groups between 50 and 74 years old. Thus, the wave 4 initial sample included 11,050 individuals. After applying the inclusion/exclusion criteria, the wave 4 analytical sample comprised 9,805 individuals (section 3.4.1.4).

Table 8 presents the socio-demographic characteristics of the wave 3 and wave 4 analytical samples. The information is reported as weighted percentages (section 3.4.2). The unweighted descriptive statistics are presented in Appendix E. The unweighted and weighted samples showed very similar distributions.

No major socio-demographic differences were found between the wave 3 and wave 4 analytic samples. Women were slightly over represented (wave 3 53.2%; wave 4: 53.0%). Mean age of respondents was about 66 years (wave 3: 65.8, SD 11.6; wave 4: 65.7, SD 12.0). Most individuals had some educational qualification (no qualifications at wave 3: 32.9%; wave 4: 31.6%), were retired or economically inactive (employed wave 3: 35.0%; wave 4: 36.8%) and were married (wave 3: 68.5%; wave 4: 69.2%).

Additionally, at wave 3, 33.6% of individuals reported poor self-rated general health, 19.1% reported poor self-rated oral health, 17.9% had no natural teeth and 6.4% reported experienced at least one oral impacts on daily performance. At wave 4, mean grip strength was 31.0 kg (SD: 13.7). During childhood, about 12% of individuals experienced poor general health (wave 3: 12.3%; wave 4: 12.2%).

In terms of socioeconomic position, at childhood, most individuals were classified within the middle SEP (wave 3: 50.5%; wave 4: 50.1%). However, the distribution changed at adulthood, the proportion of individuals at high SEP and low SEP increased, resulting in a dramatic decrease in the middle SEP (wave 3: 25.5%; wave 4: 25.1%).

Table 9 displays the distribution of socio-demographic characteristics stratified by gender. Both analytical samples, wave 3 and wave 4, showed similar results. Women were slightly older, markedly less educated (no qualification at wave 3: women 38.7%, men 26.2%; wave 4: 36.8% women, 25.6% men), more economically inactive (wave 3: 20.1%, women, 9.1% men; wave 4: 17.4% women, 9.3% men), and less likely to be employed than men (wave 3: 29.5% women, 45.3% men; wave 4: 30.4% women, 46.2% men). Also, fewer women were married (wave 3: 59.5%, women, 77.2% men; wave 4: 62.3 % women, 77.6% men), mainly because more women were widowed than men. Regarding health, more men reported poor oral health (wave 3: 17.7% women; 20.6% men), although more women had no natural teeth than men (wave 3: 20.3% women, 15.1% men). Also, women had lower mean grip strength than men (wave 4: 23.1 kg women, 39.8 kg men).

Table 8. Socio-demographic characteristics and outcomes distributions of wave 3 and wave 4 analytic samples (%)

	w3 n=8659	w4 n=9805
Gender		
Men	46.8	47.0
Women	53.2	53.0
Age group		
50 to 64	51.9	53.7
65 to 74	25.3	24.8
74+	22.7	21.5
Age continuous: Mean(SD)	65.8 (11.6)	65.7 (12.0)
Childhood SEP		
Managerial/ Professional (High)	30.5	31.7
Intermediate (Middle)	50.5	50.1
Routine/Manual (Low)	19.0	18.1
Adult SEP (household SEP)		
Managerial/ Professional (High)	39.4	41.3
Intermediate (Middle)	25.5	25.1
Routine/Manual (Low)	35.1	33.5
Self-rated Health		
Good health	66.4	
Poor health	33.6	
Self-rated Oral Health		
Good oral health	80.9	
Poor oral health	19.1	
Total tooth loss		
Dentate	82.1	
Edentate	17.9	
Oral Impacts		
No impact	93.6	
Impact	6.4	
Grip Strength: Mean(SD)		31.0 (13.7)
Education		
High degree or post-secondary qualification	36.7	37.9
Secondary qualification	30.4	30.6
No qualification	32.9	31.6
Employment status		
Employed	35.0	36.8
Retired	50.0	49.5
Other inactive	15.0	13.7
Marital Status		
Married	68.5	69.2
Single	5.4	5.5
Separated/Divorced	9.8	9.7
Widowed	16.4	15.7
Childhood self-rated health		
Good health	87.7	87.8
Poor health	12.3	12.2

Weighted percentages of imputed data

Table 9. Analytic sample socio-demographic characteristics and outcomes distributions by gender (%)

	w3 n=8659		w4=9805	
	Men n=3877	Women n= 4782	Men n=4398	Women n=5407
Age group				
50 to 64	54.9	49.4	56.2	51.5
65 to 74	25.4	25.3	25.2	24.5
74+	19.8	25.3	18.7	24.0
Age continuous: Mean(SD)	65.0 (15.5)	66.6 (16.7)	64.9 (16.2)	66.4 (17.3)
Childhood SEP				
High	28.9	31.9	30.7	32.7
Middle	51.7	49.5	51.5	48.9
Low	19.5	18.6	17.8	18.4
Adult SEP (household SEP)				
High	43.1	36.2	45.1	38.0
Middle	24.4	26.4	24.2	26.0
Low	32.4	37.4	30.7	36.1
Self-rated health				
Good	66.8	66.0		
Poor	33.2	34.0		
Self-rated oral health				
Good	79.4	82.3		
Poor	20.6	17.7		
Edentulousness				
Dentate	84.9	79.7		
Edentate	15.1	20.3		
Oral impacts				
No impact	93.5	93.6		
Impact	6.5	6.4		
Grip Strength: Mean(SD)			39.8 (17.1)	23.1 (12.3)
Education				
High degree	45.3	29.1	46.2	30.4
Secondary qualification	28.5	32.1	28.2	32.7
No qualification	26.2	38.7	25.6	36.8
Employment status				
Employed	41.3	29.5	43.6	30.8
Retired	49.5	50.4	47.1	51.7
Other inactive	9.1	20.1	9.3	17.5
Marital Status				
Married	77.3	60.7	77.0	62.2
Single	6.1	4.7	6.6	4.5
Separated/Divorced	8.3	11.1	8.1	11.0
Widowed	8.4	23.4	8.3	22.2
Childhood self-rated health				
Good health	88.4	87.1	88.6	87.2
Poor health	11.6	12.9	11.4	12.8

Weighted percentages of imputed data

4.2 Social mobility trajectories distribution

Table 10, Figure 10, and Figure 11 describe the distribution of wave 3 and wave 4 social mobility trajectories. Both analytical samples, wave 3 and wave 4, presented similar distributions.

Most individuals changed SEP from childhood to adulthood. Overall, about 40% (wave 3: 40.6%, wave 4: 40.2%) of the individuals belonged to the stable groups. Downward mobility was more common than upward mobility. At wave 3, 27.2% of individuals moved upward between childhood and adulthood and 32.2% of individuals moved downward. Correspondingly, at wave 4, 27.8% of individuals moved upward and 31.8% of individuals moved downward. Most mobility occurred from the middle SEP.

Upward mobility from low SEP were the least common trajectories (wave 3: upward low-high: 4.2%; upward low-middle: 4.4%; wave 4: upward low-high: 4.4%; upward low-middle: 4.1%); suggesting that moving upward from low SEP to any other SEP group (middle or high) was even more uncommon than moving downward from high SEP to low SEP.

Table 11 describes the distributions of wave 3 and wave 4 social trajectories stratified by gender. Both analytical samples suggested similar results. When comparing men with women, more men moved upward and more women moved downward from childhood to adulthood; although, the differences between women and men were small. For instance, the highest difference was observed in the upward trajectory from middle to high SEP, with a difference of about 5% between men and women distributions.

Table 10. Social mobility trajectories distributions (%)

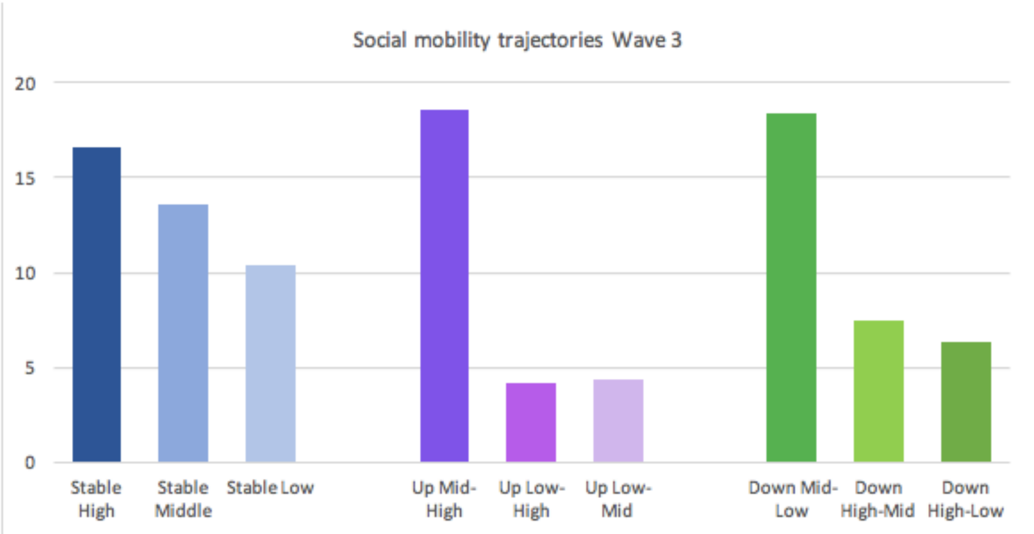
	w3 n=8659	w4 n=9805
Social Trajectories		
Stable High	16.6	17.5
Stable Middle	13.6	13.2
Stable Low	10.4	9.5
Total stable	**40.6**	**40.2**
Upward Middle to High	18.6	19.3
Upward Low to High	4.2	4.4
Upward Low to Middle	4.4	4.1
Total upwardly mobile	**27.2**	**27.8**
Downward Middle to Low	18.4	17.6
Downward High to Middle	7.5	7.8
Downward High to Low	6.3	6.4
Total downwardly mobile	**32.2**	**31.8**

Weighted percentages of imputed data

Table 11. Social mobility trajectories distributions by gender (%)

	wave 3		wave 4	
	Men n=3877	Women n=4782	Men n=4398	Women n=5407
Social Trajectories				
Stable High	17.2	16.1	18.3	16.8
Stable Middle	13.2	13.9	13.1	13.4
Stable Low	10.3	10.5	9.0	10.0
Total stable	**40.7**	**40.5**	**40.4**	**40.2**
Upward Mid-High	21.3	16.2	22.0	16.9
Upward Low-High	4.6	3.9	4.7	4.2
Upward Low-Mid	4.6	4.2	4.1	4.2
Total Upward	**30.5**	**24.3**	**30.8**	**25.3**
Downward Mid-Low	17.3	19.4	16.4	19.0
Downward High-Mid	6.7	8.3	7.1	8.4
Downward High-Low	4.9	7.5	5.2	7.5
Total Downward	**28.9**	**35.2**	**28.7**	**34.9**

Weighted percentages of imputed data



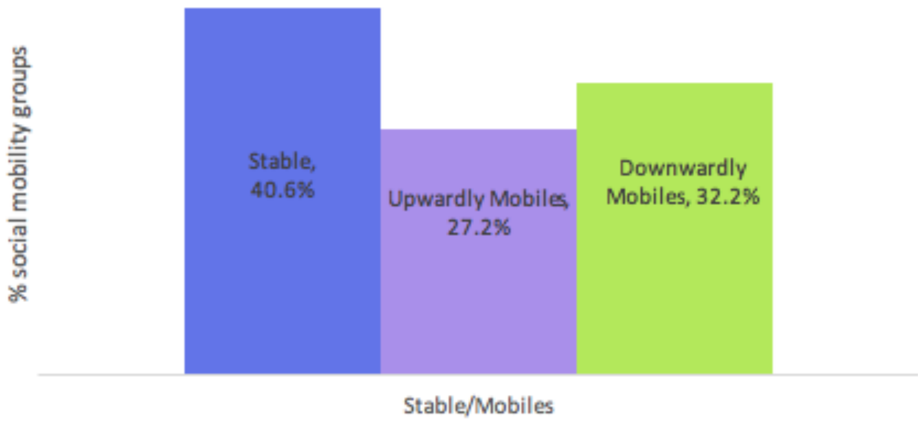
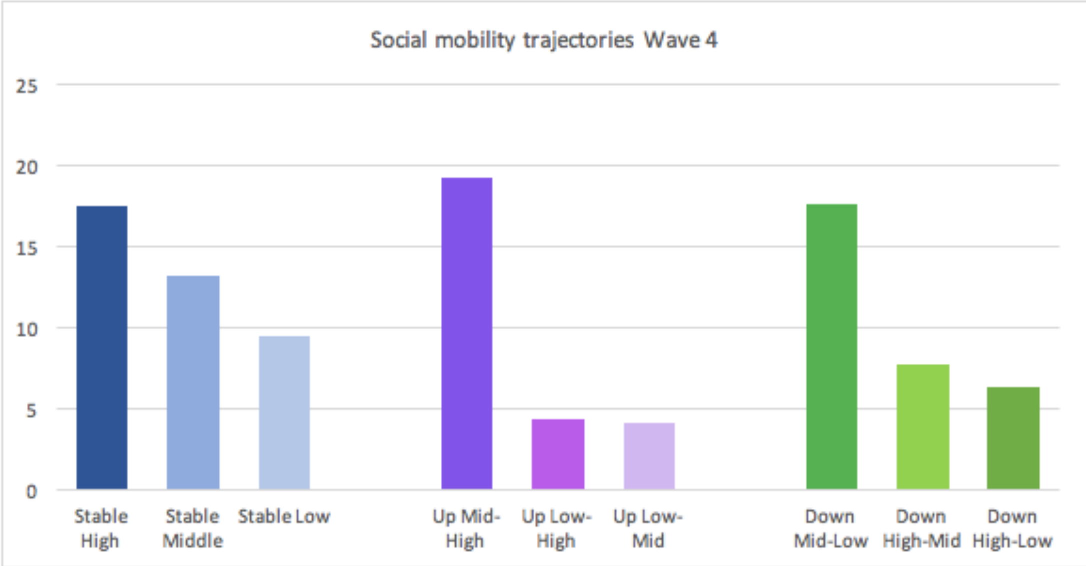


Figure 10. Wave 3 Social mobility trajectories distributions



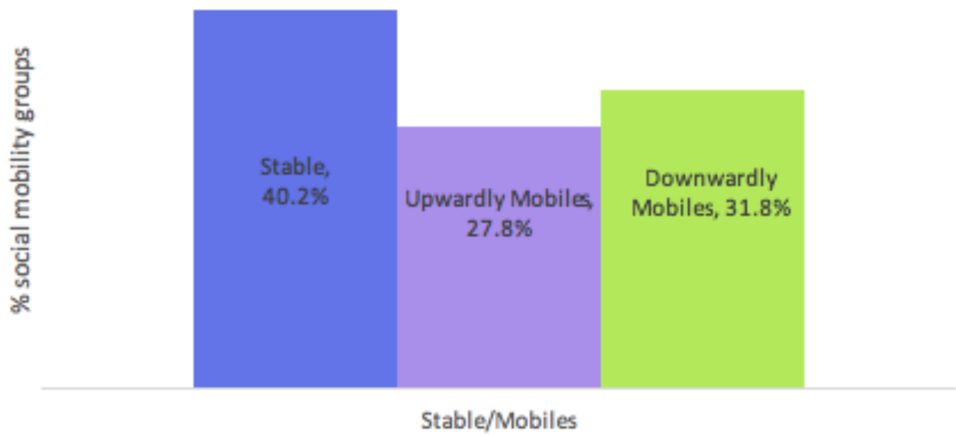


Figure 11. Wave 4 Social mobility trajectories distribution

4.3 Bivariate associations

This section aims to describe the socio-demographic characteristics associated with adverse older adulthood general health, oral health and physical function, and to describe the socio-demographic characteristics associated with each intergenerational social mobility trajectory.

To aid the comparison between outcomes, the nine social mobility trajectories were ordered. Table 12 illustrates the adopted approach to hierarchize the social mobility trajectories. Firstly, the trajectories were ordered according to the destination SEP, resulting in a hierarchy with the following order: at the top were those three trajectories with high SEP at adulthood, in an intermediate position were those three trajectories with middle SEP and at the bottom of the hierarchy were the trajectories with low adult SEP. Secondly, the initial SEP was considered, the three trajectories sharing the same adult SEP were ordered from high, middle to low childhood SEP. Therefore, social mobility trajectories were ordered from high-high SEP at the top of the hierarchy to low-low SEP at the bottom of the hierarchy. This order will be named during the study as "social trajectories hierarchy scheme".

Table 12. Adopted approach to hierarchize the nine social mobility trajectories. "Social trajectories hierarchy scheme"

First step			Second step		
Child SEP		Adult SEP	Child SEP		Adult SEP
	-	High	High	-	High
	-	High	Middle	-	High
	-	High	Low	-	High
	-	Middle	High	-	Middle
	-	Middle	Middle	-	Middle
	-	Middle	Low	-	Middle
	-	Low	High	-	Low
	-	Low	Middle	-	Low
	-	Low	Low	-	Low

4.3.1 Socio-demographic characteristics associated with the outcomes

Table 13 and Table 14 present results from regressions analyses estimating unadjusted associations between socio-demographic characteristics and each outcome.

Older respondents were more likely to report poor self-rated general health, total tooth loss, at least one OIDP, and had lower grip strength. But interestingly, older individuals were less likely to report poor self-rated oral health than their younger peers (65-74 years: OR 0.84, 95%CI 0.74-0.96; 75+ years: OR 0.85, 95%CI 0.74-0.98).

There were also marked differences by educational level. As level of education decreased, the likelihood of reporting an adverse outcome increased. For instance, compared to individuals with high or post-secondary qualification, those with secondary qualification were 1.76 (95%CI 1.56-1.98) times more likely to report poor self-rated general health, 2.10 (95%CI 1.77-2.48) times more likely to have no natural teeth, and had 4.83 kg (95%CI -5.47, -4.19) lower grip strength. For individuals with no qualifications the odds ratios were even higher, and additionally these individuals were 1.51 (95%CI 1.32-1.73) times more likely to report poor self-rated oral health, and 1.49 (95%CI 1.20-1.84) times more likely to report at least one OIDP.

Additionally, individuals out of the labour market had higher likelihood of adverse outcomes. Retired individuals were more likely to report poor self-rated general health (OR 3.10, 95%CI 2.75-3.48), total tooth loss (OR 5.92, 95%CI 4.95-7.09), and had lower grip strength (coef -9.06, 95%CI -9.61, -8.52). Moreover, economically inactive respondents additionally were more likely to report poor self-rated oral health (OR 1.55, 95%CI 1.32-1.82), and at least one OIDP (OR 2.74, 95%CI 2.08-3.59).

Also, married individuals were more likely to report favourable health outcomes, and had higher grip strength.

Furthermore, poor self-rated childhood general health, and unhealthy behaviours in adulthood were associated with adverse outcomes. With one exception, smokers (coef 1.43, 95%CI 1.37, 2.56), and ex-smokers (coef 1.97, 95%CI 0.57, 2.29) had higher grip strength than their peers who had never smoked.

In terms of socioeconomic position, childhood and adulthood SEP were associated with self-rated general health, total tooth loss and grip strength. At childhood and adulthood, as SEP level decreased the likelihood of poor self-rated general health and total tooth loss increased and the values of grip strength decreased. Self-rated oral health and OIDP were only associated with adult SEP. Furthermore, for all outcomes, associations with adult SEP were stronger than with childhood SEP, suggesting a stronger influence of proximal rather than distal SEP on adult general health, oral health and physical function. Intergenerational social mobility trajectories were associated with all outcomes showing different patterns by outcomes. These associations are further described in chapter 5.

Table 13. Unadjusted regression between health and function and socio-demographic characteristics **MODEL 1**

	Self-rated Health Poor/fair 33.6%		Self-rated Oral Health Poor/fair 19.1%		Total Tooth Loss 17.9%		Oral Impacts on Daily Performance 6.4%		Mean Grip Strength Mean (SD)= 31.0 (13.7)	
	w3 n=8659 OR (95% C.I)								w4 n=9805 Coef (95% C.I)	
Gender										
Men	1		1		1		1		0	
Women	1.04	(0.95, 1.14)	0.83	(0.74, 0.93)*	1.44	(1.28, 1.62)**	0.99	(0.82, 1.19)	-16.70	(-17.12, -16.28)**
Age group										
50 to 64	1		1		1		1		0	
65 to 74	1.42	(1.27, 1.60)**	0.84	(0.74, 0.96)*	3.37	(2.86, 3.96)**	1.57	(1.26, 1.94)**	-4.81	(-5.36, -4.26)**
74+	2.33	(2.08, 2.62)**	0.85	(0.74, 0.98)*	9.44	(8.08, 11.04)**	1.65	(1.32, 2.08)**	-11.91	(-12.54, -11.27)**
Education										
High degree	1		1		1		1		0	
Secondary qualif	1.76	(1.56, 1.98)**	1.08	(0.94, 1.24)	2.10	(1.77, 2.48)**	0.96	(0.76, 1.21)	-4.83	(-5.47, -4.19)**
No qualification	3.26	(2.91, 3.66)**	1.51	(1.32, 1.73)**	5.64	(4.83, 6.58)**	1.49	(1.20, 1.84)**	-8.39	(-9.04, -7.74)**
Childhood SEP										
High	1		1		1		1		0	
Middle	1.40	(1.24, 1.57)**	1.05	(0.90, 1.22)	1.67	(1.41, 1.97)**	1.06	(0.84, 1.34)	-0.96	(-1.62, -0.31)*
Low	2.19	(1.87, 2.55)**	1.18	(0.99, 1.42)	2.83	(2.33, 3.44)**	1.22	(0.91, 1.64)	-2.06	(-2.97, -1.16)**
Adult SEP										
High	1		1		1		1		0	
Middle	1.46	(1.29, 1.65)**	1.21	(1.05, 1.41)*	1.66	(1.41, 1.97)**	1.21	(0.95, 1.55)	-2.22	(-2.91, -1.52)**
Low	2.93	(2.62, 3.28)**	1.61	(1.41, 1.84)**	3.77	(3.27, 4.36)**	1.58	(1.27, 1.96)**	-4.93	(-5.57, -4.29)**
Social Trajectories										
Stable High	1		1		1		1		0	
Up Mid-High	1.23	(1.02, 1.49)*	0.86	(0.69, 1.07)	1.40	(1.06, 1.86)*	0.96	(0.68, 1.36)	-0.44	(-1.32, 0.43)
Up Low-High	1.56	(1.17, 2.10)*	0.87	(0.61, 1.24)	2.51	(1.72, 3.66)**	1.23	(0.71, 2.13)	-1.55	(-3.15, -0.01)*
Down High-Mid	1.44	(1.13, 1.84)*	1.07	(0.81, 1.41)	1.76	(1.24, 2.48)*	1.27	(0.80, 1.99)	-2.57	(-3.79, -1.35)**
Stable Middle	1.70	(1.40, 2.06)**	1.10	(0.89, 1.38)	2.23	(1.69, 2.95)**	1.18	(0.81, 1.71)	-2.76	(-3.77, -1.76)**
Up Low-Mid	2.18	(1.63, 2.92)**	1.23	(0.88, 1.71)	3.06	(2.10, 4.44)**	1.25	(0.72, 2.17)	-2.09	(-3.72, -0.46)*
Down High-Low	2.72	(2.11, 3.49)**	1.38	(1.02, 1.87)*	3.48	(2.51, 4.84)**	1.52	(0.93, 2.47)	-5.42	(-6.85, -4.00)**
Down Mid-Low	3.17	(2.65, 3.78)**	1.50	(1.23, 1.83)**	4.86	(3.78, 6.24)**	1.59	(1.14, 2.22)*	-5.11	(-6.05, -4.17)**
Stable Low	4.48	(3.65, 5.50)**	1.51	(1.19, 1.91)*	6.57	(5.02, 8.60)**	1.60	(1.09, 2.34)*	-5.58	(-6.73, -4.42)**

*Cross-sectional weighted values of imputed data; *p-value <0.05; ** p-value <0.001*

Table 14. Unadjusted regression between health and function and socio-demographic characteristics and behaviours **MODEL 1**

	Self-rated Health Poor/fair		Self-rated Oral Health Poor/fair		Total Tooth Loss		Oral Impacts on Daily Performance		Mean Grip Strength	
	w3 n=8659 OR (95% C.I)								w4 n=9805 Coef (95% C.I)	
Employment status										
Employed	1		1		1		1		0	
Retired	3.10	(2.75, 3.48)**	0.92	(0.81, 1.04)	5.92	(4.95, 7.09)**	1.91	(1.52, 2.41)**	-9.06	(-9.61, -8.52)**
Other inactive	6.07	(5.21, 7.07)**	1.55	(1.32, 1.82)**	4.01	(3.21, 5.00)**	2.74	(2.08, 3.59)**	-9.50	(-10.37, -8.62)**
Marital status										
Married	1		1		1		1		0	
Single	1.66	(1.36, 2.04)**	1.55	(1.22, 1.96)**	1.51	(1.15, 1.98)*	1.12	(0.73, 1.72)	-0.84	(-2.08, 0.39)
Separated	1.90	(1.64, 2.21)**	2.11	(1.79, 2.49)**	1.36	(1.09, 1.64)*	1.90	(1.46, 2.47)**	-2.81	(-3.68, -1.93)**
Widowed	1.96	(1.73, 2.22)**	1.09	(0.93, 1.28)	4.24	(3.70, 4.86)**	1.57	(1.24, 2.00)**	-10.65	(-11.32, -9.98)**
Chid health										
Good	1		1		1		1		0	
Poor	2.24	(1.92, 2.62)**	1.51	(1.27, 1.81)**	1.29	(1.06, 1.57)*	1.56	(1.19, 2.05)*	-2.03	(-3.04, -1.02)**
Smoking										
Never smoke	1		1		1		1		0	
Ex-smoker	1.32	(1.19, 1.46)**	1.32	(1.16, 1.50)**	1.62	(1.42, 1.86)**	1.28	(1.03, 1.58)*	1.97	(1.37, 2.56)**
Smoker	2.01	(1.75, 2.31)**	2.22	(1.89, 2.61)**	2.30	(1.94, 2.72)**	1.95	(1.50, 2.52)**	1.43	(0.57, 2.29)*
Physical activity										
Active	1		1		1		1		0	
Non-active	3.90	(3.38, 4.51)**	2.10	(1.81, 2.45)**	2.63	(2.26, 3.06)**	2.39	(1.89, 3.02)**	-4.17	(-5.04, -3.29)**

*Cross-sectional weighted values of imputed data; *p-value <0.05; ** p-value <0.001*

4.3.2 Socio-demographic characteristics associated with social mobility trajectories

Table 15, and Table 16 display the distribution of individuals by social trajectories. Similar distributions were observed on both analytical samples, wave 3 and wave 4.

There was a general trend that in the “social trajectories hierarchy scheme”, young, highly educated, employed, and married respondents were more prevalent at the top of the hierarchy and in those trajectories moving upwardly. Showing linear associations. For example, at wave 3, the proportion of individuals with high education degree gradually decreased from the top to the bottom of the social trajectories hierarchy, from 71.3% in stable high to 9.3% in stable low. Conversely, the distribution of individuals with no qualification increased from 7.2% in stable high to 67.0% in stable low. There were also differences by employment status. Employed individuals were more likely to have experienced trajectories with high SEP at adulthood, and economically inactive individuals were more likely to have experienced trajectories with low SEP at adulthood. For instance, at wave 4, the proportion of employed individuals decreased from 47.8% to 22.7%, and the proportion of economically inactive individuals increased from 8.4% to 21.7% from the top to the bottom of the hierarchy. Also, married individuals were more prevalent within trajectories at the top of the “hierarchical scheme” than within trajectories at the bottom of the scheme.

In terms of behaviours, the higher the position in the trajectories hierarchy, the lower the chances of being current smoker and being physically inactive.

Lastly, individuals reporting poor self-rated childhood health were more likely to have experienced downward mobility and low adult SEP, and less likely to have experienced upward mobility and high SEP at adulthood.

Table 15. Bivariate association between social mobility trajectories and socio-demographic characteristics and behaviours (%).
Wave 3, n=8659

	Stable High	Upward Mid-High	Upward Low-High	Downward High-Middle	Stable Middle	Upward Low-Mid	Downward High-Low	Downward Mid-Low	Stable Low	*p-value*
Age group										
50 to 64	60.9	57.2	56.4	51.5	51.3	54.5	47.1	43.1	44.9	<0.001
65 to 74	23.1	22.3	25.9	23.3	26.3	26.1	29.1	29.2	24.8	
74+	16.1	20.4	17.6	25.1	22.3	19.4	23.8	27.7	30.2	
Education										
High degree	71.3	57.3	47.7	36.8	27.7	22.0	20.8	13.0	9.3	<0.001
Secondary qualif	21.4	27.0	28.9	39.7	39.6	39.1	32.7	32.8	23.7	
No qualification	7.2	15.7	23.4	23.5	32.7	38.9	46.5	54.2	67.0	
Employment status										
Employed	45.0	40.6	39.9	39.5	36.9	37.1	25.9	25.3	23.6	<0.001
Retired	44.4	49.2	50.1	46.3	49.2	47.3	50.6	55.9	54.1	
Other inactive	10.6	10.2	10.0	14.2	13.9	15.6	23.4	18.8	22.3	
Marital status										
Married	81.2	81.8	79.1	64.9	72.2	73.5	50.3	54.3	51.9	<0.001
Single	4.3	4.3	4.2	5.7	4.0	5.3	6.6	6.4	8.4	
Separated	6.2	5.9	7.8	10.2	8.7	9.7	14.7	14.3	13.6	
Widowed	8.3	8.0	9.0	19.2	15.2	11.5	28.4	25.0	26.1	
Chid health										
Good	89.5	89.3	87.9	88.0	88.1	87.5	86.7	85.2	86.0	0.02
Poor	10.5	10.7	12.1	12.0	11.9	12.5	13.3	14.8	14.0	
Smoking										
Never smoke	41.7	39.6	38.2	40.0	38.1	36.2	37.4	33.2	30.3	<0.001
Ex-smoker	48.8	49.4	49.8	47.5	47.5	43.9	44.6	45.5	44.1	
Smoker	9.5	11.1	11.9	12.4	14.4	19.9	18.0	21.3	25.6	
Physical activity										
Active	92.5	89.8	89.6	86.7	86.7	87.9	81.8	82.7	82.2	<0.001
Non-active	7.5	10.2	10.4	13.3	13.3	12.1	18.2	17.3	17.8	

Cross-sectional weighted values of imputed data
p-value was calculated for each imputed data set, the highest one is reported

Table 16. Bivariate association between social mobility trajectories and socio-demographic characteristics and behaviours (%).
Wave 4, n=9805

	Stable High	Upward Mid-High	Upward Low-High	Downward High-Middle	Stable Middle	Upward Low-Mid	Downward High-Low	Downward Mid-Low	Stable Low	*p-value*
Age group										
50 to 64	62.8	59.3	55.7	54.6	51.3	55.7	48.3	45.1	46.1	<0.001
65 to 74	22.3	22.9	26.5	22.4	25.7	25.1	28.6	27.6	25.2	
74+	15.0	17.8	17.8	23.0	23.0	19.3	23.1	27.4	28.7	
Education										
High degree	73.1	56.7	43.8	38.6	26.9	19.7	23.1	13.1	10.1	<0.001
Secondary qualif	20.9	27.1	31.9	40.0	40.0	41.3	32.9	31.9	25.5	
No qualification	6.0	16.2	24.4	21.4	33.0	39.0	44.1	55.0	64.4	
Employment status										
Employed	47.8	43.5	41.9	41.0	36.4	37.6	28.0	26.6	22.7	<0.001
Retired	44.1	46.3	48.1	46.0	50.4	45.4	52.9	56.3	55.6	
Other inactive	8.4	10.2	9.9	13.0	13.3	17.0	19.1	17.1	21.7	
Marital status										
Married	81.1	81.0	78.9	68.8	73.1	71.6	53.3	54.2	51.1	<0.001
Single	4.3	5.0	4.0	4.9	4.5	5.6	6.3	6.1	9.0	
Separated	6.5	5.8	8.1	10.3	7.5	10.6	13.9	14.7	13.9	
Widowed	8.1	8.1	9.0	15.9	14.9	12.2	26.6	25.0	25.9	
Chid health										
Good	90.2	88.9	88.3	89.2	88.1	87.4	86.9	85.6	84.6	0.01
Poor	9.8	11.9	11.7	10.8	11.9	12.6	13.1	14.4	15.4	
Smoking										
Never smoke	44.4	40.6	39.4	43.2	41.1	35.3	38.8	32.3	302	<0.001
Ex-smoker	47.7	48.1	47.9	44.7	44.6	44.1	44.3	45.7	43.8	
Smoker	8.0	11.3	12.7	12.1	14.3	20.5	17.0	22.0	26.0	
Physical activity										
Active	90.2	88.8	88.3	87.2	86.6	85.3	84.7	81.1	77.7	<0.001
Non-active	9.8	11.2	11.7	12.8	13.4	14.7	15.3	18.9	22.3	

Cross-sectional weighted values of imputed data
p-value was calculated for each imputed data set, the highest one is reported

4.3.3 Correlation between oral health outcomes

The different oral health outcomes used in this study are likely to be correlated. For instance, it has been observed that total tooth loss is associated with unfavourable scores of oral health related quality of life (similar to oral impacts on daily performance) (Sanders et al. 2009; Gerritsen et al. 2010).

The bivariate analysis between oral health outcomes (Table 17) revealed a positive correlation between having at least one oral impact and self-rated oral health (OR 7.60, 95%CI 6.28-9.21). In other words, those reporting at least one oral impact on daily performance were 7.6 times more likely to rate their oral health as poor/fair. Additionally, although there was no statistically significant difference, the analysis suggested that individuals with total tooth loss were more likely to rate their oral health as good than the dentate individuals (OR 0.87, 95%CI 0.74-1.02). However, respondents with total tooth loss were more likely to have reported at least one oral impact on daily performance (OR 1.74, 95%CI 1.40-2.16).

Table 17. Bivariate analysis of relationship between oral health outcomes

	Self-rated oral health Poor/fair	Edentulousness	Oral impacts on daily performance
	w3 n=8659 OR (95% C.I)		
Self-rated oral health			
Good	-	1	1
Poor	-	0.87 (0.74, 1.02)	7.60 (6.28, 9.21)**
Total tooth loss			
Dentate	1	-	1
Edentate	0.87 (0.74, 1.02)	-	1.74 (1.40, 2.16)**
Oral impacts			
No impact	1	1	-
Impact	7.60 (6.28, 9.21)**	1.74 (1.40, 2.16)**	-

*Cross-sectional weighted values of imputed data; ** p-value <0.001*

CHAPTER 5

MULTIPLE REGRESSION ANALYSIS

5 Association between intergenerational social mobility and the outcomes: multiple regression analysis

This chapter seeks to explore the associations between intergenerational social mobility trajectories and the general health, oral health and physical function of older adults, accounting for socio-demographic characteristics and health-related behaviours.

Five sections organize the chapter, one for each outcome. Each section is divided in two. First, the association between social trajectories and the outcome is outlined, considering how this association was explained by socio-demographic factors and behaviours. Second, the pattern of association between social trajectories and the outcome is described, noting whether a social gradient was present.

Additionally, the analyses presented in this chapter were conducted using imputed data (section 3.4.1). To test the robustness of the results using imputed data, and compare the results if a different approach to handling missing data is adopted, a sensitivity analysis using complete case data was conducted. The results of the sensitivity analysis were included at the end of each section.

SELF-RATED GENERAL HEALTH

5.1 Self-rated general health

5.1.1 Association between poor self-rated general health and social mobility trajectories

Table 18 and Figure 12 display the results of the logistic regression analyses exploring the association between intergenerational social mobility trajectories and adult poor self-rated general health with the inclusion of covariates following sequential adjustment (section 3.4.3). Additional tables presenting sequential adjustment for each covariate added separately can be found in Appendix F.

Model 1 explored the unadjusted association between intergenerational social trajectories and poor self-rated general health. Compared to the individuals who remained stable in the high SEP over time (reference group), individuals who experienced any other social mobility trajectory were more likely to report poor self-rated general health, suggesting a graded pattern. This pattern is described later in this chapter.

These associations were slightly affected by adjustment for gender and age (Model 2) with the estimated odd ratios decreasing gently.

Model 3 additionally included education. Education was added alone because it was considered the most influential factor on intergenerational social mobility in the existing literature (section 1.3.1). Adjusting for education caused a considerable attenuation of the association between social trajectories and poor self-rated general health. The estimates of all trajectories reduced by 8% to 31%. In other words, in some of the trajectories, education explained up to nearly a third of the association between social trajectories and poor self-rated general health.

The inclusion of behaviours, namely smoking and physical activity, in model 4, and employment status, marital status, and childhood health in Model 5, only slightly affected the estimates.

After full adjustment (Model 5), the association between intergenerational social mobility and poor self-rated general health persisted. Four of the eight social trajectories were associated with significantly greater odds of poor self-rated general health, compared to stable high SEP group. Individuals who experienced low SEP at both time points were 2.30 (95%CI 1.82-2.91) times more likely than the stable high SEP group to report poor self-rated general health. Also, individuals moving downward from middle to low SEP were 1.71 (95%CI 1.40-2.09) times, individuals moving downward from high to low SEP were 1.50 (95%CI 1.14-1.97) times, and individuals moving upward from low to middle SEP were 1.52 (95%CI 1.10-2.09) times more likely to rate their general health poorly than the stable high SEP group.

Overall, these results suggested an independent association between intergenerational social mobility trajectories and poor self-rated general health.

Table 18. Association between social mobility trajectories and poor self-rated general health
Sequentially adjusted logistic regression models OR (95%CI)
Wave 3, n=8659, poor self-rated general health (SRH): 33.6%

	Model 1 SRH +Social trajectories (Unadjusted model)		Model 2: M1 +gender +age		Model 3: M2 +education		Model 4: M3 +behaviours		Model 5: M4 +ES+MS+CH (Full adjusted model)	
Social trajectories										
Stable High	1		1		1		1		1	
Up Mid-High	1.23	(1.02, 1.49)*	1.20	(1.00, 1.45)	1.11	(0.92, 1.34)	1.09	(0.90, 1.32)	1.09	(0.90, 1.32)
Up Low-High	1.56	(1.17, 2.10)*	1.54	(1.15, 2.06)*	1.34	(1.00, 1.79)*	1.32	(0.98, 1.78)	1.31	(0.97, 1.78)
Down High-Mid	1.44	(1.13, 1.84)*	1.33	(1.04, 1.70)*	1.15	(0.89, 1.47)	1.08	(0.84, 1.40)	1.06	(0.81, 1.38)
Stable Middle	1.70	(1.40, 2.06)**	1.61	(1.33, 1.96)**	1.30	(1.06, 1.59)*	1.23	(1.00, 1.51)*	1.21	(0.98, 1.49)
Up Low-Mid	2.18	(1.63, 2.92)**	2.14	(1.59, 2.87)**	1.64	(1.22, 2.22)*	1.57	(1.16, 2.13)*	1.52	(1.10, 2.09)*
Down High-Low	2.72	(2.11, 3.49)**	2.54	(1.97, 3.28)**	1.94	(1.50, 2.52)**	1.76	(1.33, 2.29)**	1.50	(1.14, 1.97)*
Down Mid-Low	3.17	(2.65, 3.78)**	2.89	(2.42, 3.45)**	2.10	(1.73, 2.54)**	1.93	(1.59, 2.36)**	1.71	(1.40, 2.09)**
Stable Low	4.48	(3.65, 5.50)**	4.13	(3.36, 5.07)**	2.84	(2.27, 3.55)**	2.62	(2.08, 3.28)**	2.30	(1.82, 2.91)**

M1: unadjusted model: poor self-rated health and social trajectories; M2: adjusted for gender and continuous age; M3: adjusted for gender, age and education; M4: adjusted for gender, age, education, smoking and physical activity; M5: full adjusted model: adjusted for gender, age, education, smoking, physical activity, employment status, marital status and childhood health.
*Cross-sectional weighted values of imputed data; *p-value <0.05; ** p-value <0.001*

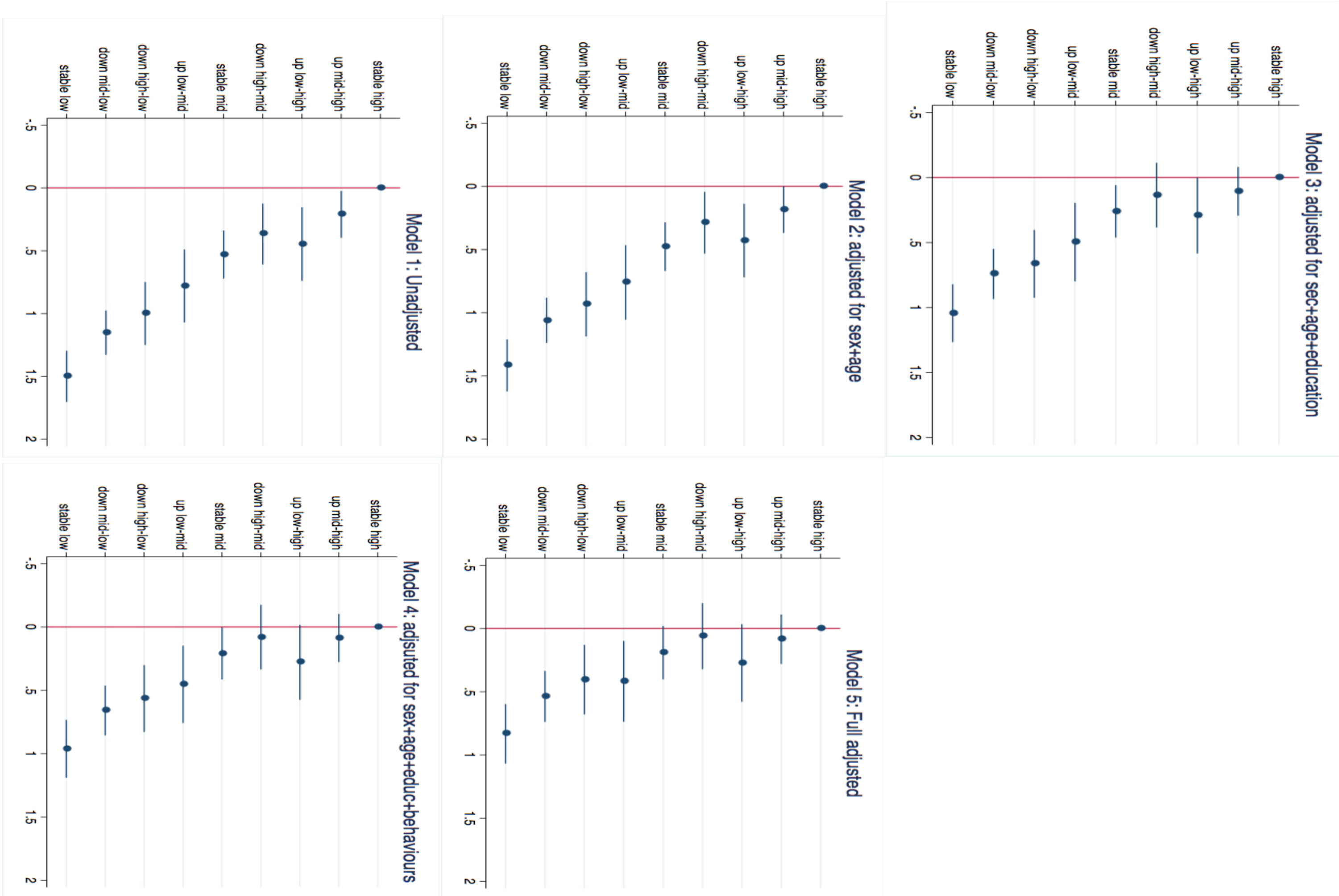


Figure 12. Logistic regression between social trajectories and self-rated general health, sequential models including covariates.

5.1.2 Pattern of association between poor self-rated general health and social mobility trajectories

To observe the pattern of association between social mobility and poor self-rated health, the trajectory groups were ordered from the lowest OR to the highest OR of reporting poor self-rated general health based on the results of the fully adjusted model (Table 19).

From Model 1 to Model 3 the pattern of association was in line with the “social trajectories hierarchy scheme”. At the bottom, with the highest ORs of reporting poor self-rated general health, were the trajectories with low adult SEP, at the top of the gradient, with the lowest ORs, were the trajectories with high adult SEP, and those trajectories with middle adult SEP were in an intermediate position.

However, the fully adjusted model (Model 5) revealed a different pattern. Although not all the trajectories were statistically significant, a gradient suggesting an accumulative effect of SEP was found. The trajectories that shared the same SEP categories but had different directions (e.g.: upward mobility from low to high SEP and downward mobility from high to low SEP) were next to each other, showing the following order from the highest to the lowest OR: at the bottom of the gradient, with the highest estimated OR for reporting poor self-rated general health, was the stable low SEP group (OR: 2.30 95%CI 1.82-2.91). The trajectories moving between low and middle SEP were just above in the gradient (downward middle to low: OR: 1.71 95%CI 1.40-2.09; upward low to middle: OR: 1.52 95%CI 1.10-2.09). Above these trajectories, were those individuals moving between high and low SEP (downward high to low: OR: 1.50 95%CI 1.14-1.97; upward low to high: OR: 1.31 95%CI 0.97-1.78). Just above, was the trajectory stable middle SEP (OR: 1.21 95%CI 0.98-1.49). At the top of the gradient, were those individuals moving between middle and high SEP (upward middle to high: OR: 1.09 95%CI 0.90-1.32; downward high to middle: OR:

1.06 95%CI 0.81-1.38). Lastly, the lowest estimated OR for poor self-rated general health was found for the reference group: stable high SEP.

Additionally, the observed pattern suggested a persistent relationship between intergenerational social mobility and self-rated general health: it was found that levels of self-rated general health of upwardly and downwardly mobile individuals tended to be somewhere between those observed for the stable individuals from SEP they left and the stable individuals from the SEP they joined. For instance, individuals who were upwardly mobile had better self-rated general health level than the stable members of the SEP they had left, but worse self-rated general health than the stable members of the SEP they moved into. The same was observed for downwardly mobile individuals in the opposite direction; those who were downwardly mobile had worse self-rated general health level than the individuals from the SEP they left but better self-rated general health than those individuals who remained stable in the SEP they joined.

Table 19. Pattern of association between social trajectories and self-rated general health
Ordered from the lowest to the highest OR (95%CI)

	Model 1: Unadjusted model		Model 3: Adjusted for gender+age+educ		Model 4: Adjusted for gender+age+educ+beh		Model 5: Fully adjusted model	
Social Trajectories								
Stable High	1		1		1		1	
Down High-Mid	1.44	(1.13, 1.84)*	1.15	(0.89, 1.47)	1.08	(0.84, 1.40)	1.06	(0.81, 1.38)
Up Mid-High	1.23	(1.02, 1.49)*	1.11	(0.92, 1.34)	1.09	(0.90, 1.32)	1.09	(0.90, 1.32)
Stable Middle	1.70	(1.40, 2.06)**	1.30	(1.06, 1.59)*	1.23	(1.00, 1.51)*	1.21	(0.98, 1.49)
Up Low-High	1.56	(1.17, 2.10)*	1.34	(1.00, 1.79)*	1.32	(0.98, 1.78)	1.31	(0.97, 1.78)
Down High-Low	2.72	(2.11, 3.49)**	1.94	(1.50, 2.52)**	1.76	(1.33, 2.29)**	1.50	(1.14, 1.97)*
Up Low-Mid	2.18	(1.63, 2.92)**	1.64	(1.22, 2.22)*	1.57	(1.16, 2.13)*	1.52	(1.10, 2.09)*
Down Mid-Low	3.17	(2.65, 3.78)**	2.10	(1.73, 2.54)**	1.93	(1.59, 2.36)**	1.71	(1.40, 2.09)**
Stable Low	4.48	(3.65, 5.50)**	2.84	(2.27, 3.55)**	2.62	(2.08, 3.28)**	2.30	(1.82, 2.91)**

Order from highest to lowest OR based on model 5: the full-adjusted model
M1: unadjusted model: poor self-rated health and social trajectories; M3: adjusted for gender, age and education;
M4: adjusted for gender, age, education, smoking and physical activity; M5: full adjusted model: adjusted for gender, age, education, smoking, physical activity, employment status, marital status and childhood health.
*Cross-sectional weighted values of imputed data; *p-value <0.05; ** p-value <0.001*

5.1.3 Sensitivity analysis: comparison with complete case analysis

The regression analysis presented in the previous section was repeated using only the individuals who had complete data in all variables, aiming to compare the differences and similarities of a different approach to dealing with missing data. The full description of the sampling procedure is included in the methodology chapter (section 3.4.3.2).

The findings from the complete case analysis are presented in detail in Appendix G. Results showed that the complete case analysis underestimated the magnitude of the associations compared to the imputed data analysis. However, the associations between intergenerational social mobility and adult self-rated general health showed the same direction.

SELF-RATED ORAL HEALTH

5.2 Self-rated oral health

5.2.1 Association between poor self-rated oral health and social mobility trajectories

Table 20 and Figure 13 display the results of the logistic regression analyses exploring the association between intergenerational social mobility trajectories and poor adult self-rated oral health with sequential inclusion of covariates (section 3.4.3).

The initial unadjusted model (Model 1) showed that the three social trajectories with adult low SEP were significantly more likely to report poor oral health than the stable high SEP group. Those who remained stable in the low SEP group over time were 1.51 (95%CI 1.19-1.91) times, downwardly mobile individuals from middle to low SEP were 1.50 (95%CI 1.23-1.83) times, and downwardly mobile individuals from high to low SEP were 1.38 (95%CI 1.02-1.87) times more likely to report poor oral health than the reference group: the sable high SEP group.

These associations were fully explained by the inclusion of education in Model 3, and smoking status in Model 4 (specific details in Appendix F, Table 47). The inclusion of education almost completely explained the observed associations. The estimates were attenuated and only one trajectory remained statistically significant after adjustment for education (Model 3: downward middle to low SEP: OR: 1.31, 95%CI 1.06-1.64).

In the fully adjusted model (Model 5), ORs for all trajectories were very close to 1, suggesting that the associations between intergenerational social mobility trajectories and self-rated oral health were fully explained by covariates.

Table 20. Association between social mobility trajectories and poor self-rated oral health
Sequentially adjusted logistic regression models OR (95%CI)
w3 n=8659; poor self-rated oral health (SRoH): 19.1%

	Model 1 SRoH +Social trajectories (Unadjusted model)		Model 2: M1+age+gender		Model 3: M2+education		Model 4: M3+behaviours		Model 5: M4+ES=MS+CH (Full adjusted model)	
Social trajectories										
Stable High	1		1		1		1		1	
Up Mid-High	0.86	(0.69, 1.07)	0.86	(0.69, 1.06)	0.83	(0.66, 1.03)	0.81	(0.65, 1.00)	0.81	(0.65, 1.01)
Up Low-High	0.87	(0.61, 1.24)	0.87	(0.61, 1.24)	0.82	(0.57, 1.16)	0.80	(0.56, 1.14)	0.78	(0.55, 1.12)
Down High-Mid	1.07	(0.81, 1.41)	1.11	(0.84, 1.46)	1.04	(0.79, 1.38)	1.00	(0.76, 1.31)	0.93	(0.71, 1.23)
Stable Middle	1.10	(0.89, 1.38)	1.13	(0.91, 1.41)	1.02	(0.81, 1.29)	0.97	(0.77, 1.23)	0.93	(0.74, 1.18)
Up Low-Mid	1.23	(0.88, 1.71)	1.24	(0.89, 1.73)	1.09	(0.78, 1.53)	1.02	(0.73, 1.44)	0.97	(0.69, 1.36)
Down High-Low	1.38	(1.02, 1.87)*	1.45	(1.06, 1.97)*	1.25	(0.91, 1.72)	1.14	(0.83, 1.56)	1.00	(0.72, 1.38)
Down Mid-Low	1.50	(1.23, 1.83)**	1.56	(1.27, 1.91)**	1.31	(1.06, 1.64)*	1.19	(0.96, 1.49)	1.06	(0.85, 1.33)
Stable Low	1.51	(1.19, 1.91)*	1.56	(1.23, 1.98)**	1.26	(0.98, 1.63)	1.12	(0.86, 1.45)	0.99	(0.76, 1.29)

M1: unadjusted model: association between social mobility trajectories and poor self-rated oral health; M2: adjusted for gender and continuous age; M3: adjusted for gender, age and education; M4: adjusted for gender, age, education, smoking and physical activity; M5: full adjusted model: adjusted for gender, age, education, smoking, physical activity, employment status, marital status and childhood health.
*Cross-sectional weighted values of imputed data; *p-value <0.05; ** p-value <0.001.*

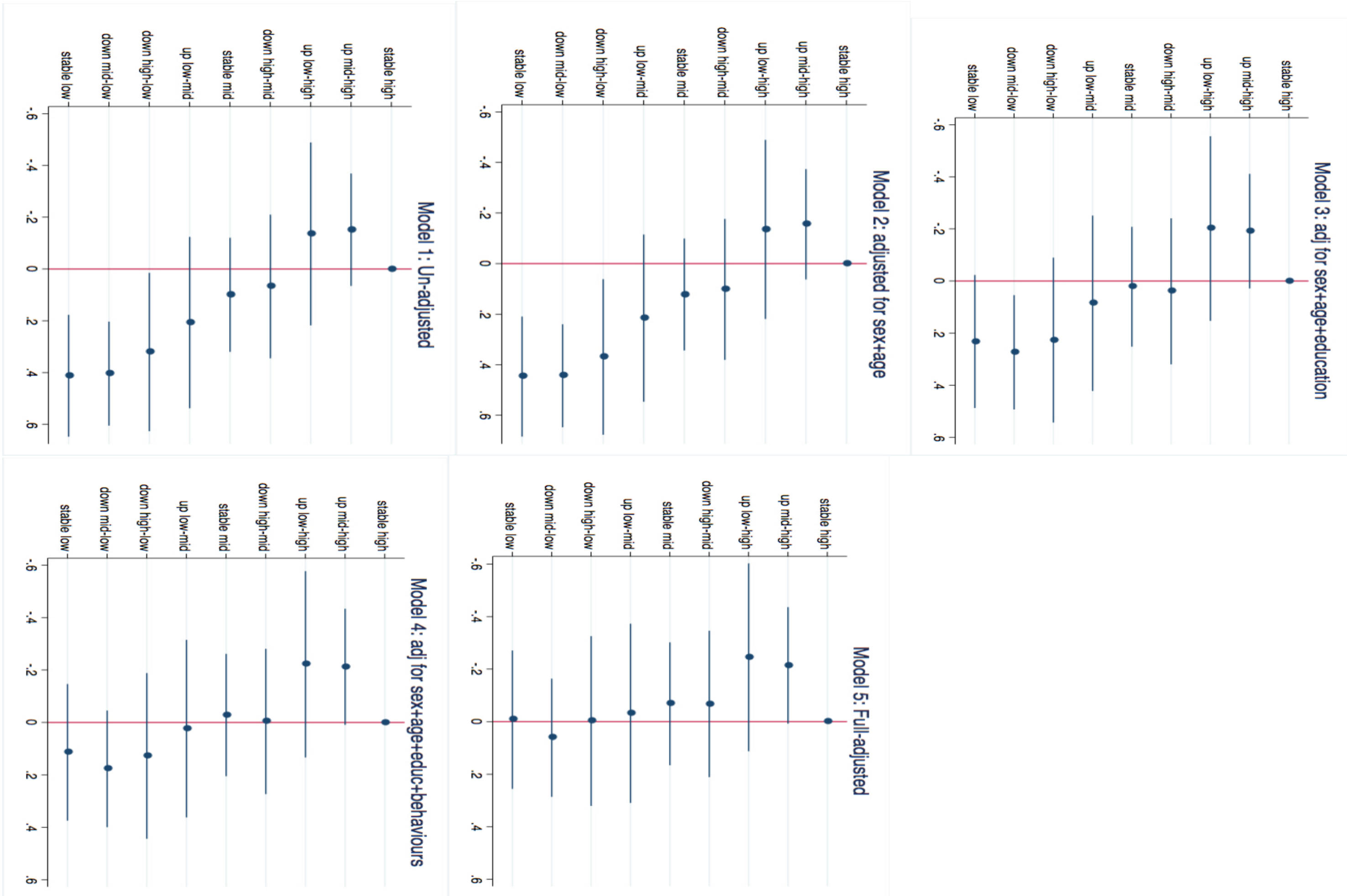


Figure 13. Logistic regression between social trajectories and self-rated oral health, sequential models including covariates.

5.2.2 Pattern of association between poor self-rated oral health and social mobility trajectories

Table 21 shows the trajectory groups ordered from the lowest odds ratio to the highest odds ratio of reporting poor self-rated oral health according the results of the fully adjusted model.

As already mentioned in the previous section, from model 4 the associations between social trajectories and self-rated oral health were fully explained by covariates, and no trajectory was statically significant. Even so, a persistent pattern can be observed throughout the models. All models showed a consistent pattern in relation with adult SEP. The highest ORs were observed among individuals with low SEP at adulthood. In an intermediate position, were the trajectories with middle SEP at adulthood. Finally, the lowest ORs of reporting poor self-rated oral health were observed among the trajectories with high SEP at adulthood.

Table 21. Pattern of association between social trajectories and self-rated oral health
Ordered from the lowest to the highest OR (95%CI)

	Model 1: Unadjusted model		Model 3: Adjusted for gender+age+education		Model 5: Fully adjusted model	
Social Trajectories						
Stable High	1		1		1	
Up Low-High	0.87	(0.61, 1.24)	0.82	(0.57, 1.16)	0.78	(0.55, 1.12)
Up Mid-High	0.86	(0.69, 1.07)	0.83	(0.66, 1.03)	0.81	(0.65, 1.01)
Down High-Mid	1.07	(0.81, 1.41)	1.04	(0.79, 1.38)	0.93	(0.71, 1.23)
Stable Middle	1.10	(0.89, 1.38)	1.02	(0.81, 1.29)	0.93	(0.74, 1.18)
Up Low-Mid	1.23	(0.88, 1.71)	1.09	(0.78, 1.53)	0.97	(0.69, 1.36)
Stable Low	1.51	(1.19, 1.91)*	1.26	(0.98, 1.63)	0.99	(0.76, 1.29)
Down High-Low	1.38	(1.02, 1.87)*	1.25	(0.91, 1.72)	1.00	(0.72, 1.38)
Down Mid-Low	1.50	(1.23, 1.83)**	1.31	(1.06, 1.64)*	1.06	(0.85, 1.33)

Order from highest to lowest OR based on model 5: the full-adjusted model
M1: unadjusted model: association between social mobility trajectories and poor self-rated oral health; M3: adjusted for gender, age and education; M5: fully adjusted model: adjusted for gender, age, education, smoking, physical activity, employment status, marital status and childhood health.
*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001*

5.2.3 Sensitivity analysis: comparison with complete case analysis

As a sensitivity test, the analyses were repeated using complete case data. All tables and details of the complete case analysis are shown in Appendix G.

Overall, the results of both analyses (complete data and imputed data) were very similar. Again, the complete case analysis tended to slightly underestimate the associations between intergenerational social mobility and self-rated oral health.

TOTAL TOOTH LOSS

5.3 Total tooth loss

5.3.1 Association between total tooth loss and social mobility trajectories

Table 22 and Figure 14 present the results of the logistic regression analyses exploring the association between intergenerational social mobility trajectories and total tooth loss with the sequential inclusion of covariates (section 3.4.3).

Model 1 explored the unadjusted association between social trajectories and total tooth loss. Compared to the individuals who remained stable in the high SEP over time, individuals who experienced any other intergenerational social mobility trajectory were significantly more likely to report total tooth loss, suggesting a graded pattern that will be described later in this chapter.

These findings were marginally affected by adjustment for gender (Appendix F, Table 49). However, the inclusion of age in Model 2, and the inclusion of education in Model 3 partially explained these associations. Education caused the greatest impact. In Model 3, the estimates were attenuated by 9% to 35%, suggesting that in some of the trajectories, education explained up to 35% of the association between social trajectories and total tooth loss. Furthermore, two of the trajectories became not statistically significant.

Findings in model 3 were slightly affected by adjustment for behaviours in Model 4, and by adjustment for employment status, marital status and childhood health in Model 5.

After full adjustment (Model 5), the association between social trajectories and total tooth loss remained robust. Compared to the stable high SEP group, six trajectories were significantly more likely to report total tooth loss. For instance, individuals who remained stable in low SEP were more than 3 times (OR 3.35 95%CI 2.44-4.60) more likely of have no natural teeth than the stable high SEP group. Also, those individuals who moved between low and middle SEP, and those individuals who moved between high and low SEP were about 2 times more likely, and the stable middle SEP group was 1.51 (95%CI 1.11-2.04) times more likely to report total tooth loss than the stable high SEP group.

Table 22. Association between social mobility trajectories and total tooth loss
Sequentially adjusted logistic regression models OR (95%CI)
Wave 3, n=8659, Total tooth loss (TTL): 17.9%

	Model 1 TTL +Social trajectories (Unadjusted model)		Model 2: M1+ gender +age		Model 3: M2+education		Model 4: M3 +behaviours		Model 5: M4+ES+MS+CH (Full adjusted model)	
Social trajectories										
Stable High	1		1		1		1		1	
Up Mid-High	1.40	(1.06, 1.86)*	1.37	(1.03, 1.82)*	1.24	(0.93, 1.66)	1.24	(0.92, 1.66)	1.23	(0.92, 1.66)
Up Low-High	2.51	(1.72, 3.66)**	2.66	(1.79, 3.96)**	2.25	(1.50, 3.36)**	2.27	(1.51, 3.42)**	2.23	(1.48, 3.36)**
Down High-Mid	1.76	(1.24, 2.48)*	1.29	(0.89, 1.88)	1.10	(0.75, 1.59)	1.06	(0.72, 1.56)	1.05	(0.71, 1.55)
Stable Middle	2.23	(1.69, 2.95)**	2.02	(1.51, 2.68)**	1.56	(1.16, 2.11)*	1.53	(1.13, 2.08)*	1.51	(1.11, 2.04)*
Up Low-Mid	3.06	(2.10, 4.44)**	3.26	(2.20, 4.85)**	2.42	(1.61, 3.64)**	2.34	(1.55, 3.54)**	2.30	(1.52, 3.48)**
Down High-Low	3.48	(2.51, 4.84)**	2.96	(2.08, 4.21)**	2.16	(1.50, 3.11)**	2.07	(1.43, 2.99)**	1.96	(1.35, 2.85)**
Down Mid-Low	4.86	(3.78, 6.24)**	4.18	(3.23, 5.39)**	2.88	(2.18, 3.79)**	2.66	(2.01, 3.53)**	2.55	(1.92, 3.39)**
Stable Low	6.57	(5.02, 8.60)**	6.01	(4.54, 7.96)**	3.88	(2.85, 5.27)**	3.50	(2.56, 4.79)**	3.35	(2.44, 4.60)**

M1: unadjusted model: total tooth loss and social trajectories; M2: adjusted for gender and continuous age; M3: adjusted for gender, age and education; M4: adjusted for gender, age, education, smoking and physical activity; M5: full adjusted model: adjusted for gender, age, education, smoking, physical activity, employment status, marital status and childhood health.
Order from highest to lowest OR based on model 5: the full-adjusted model
*Cross-sectional weighted values of imputed data; *p-value <0.05; ** p-value <0.001*

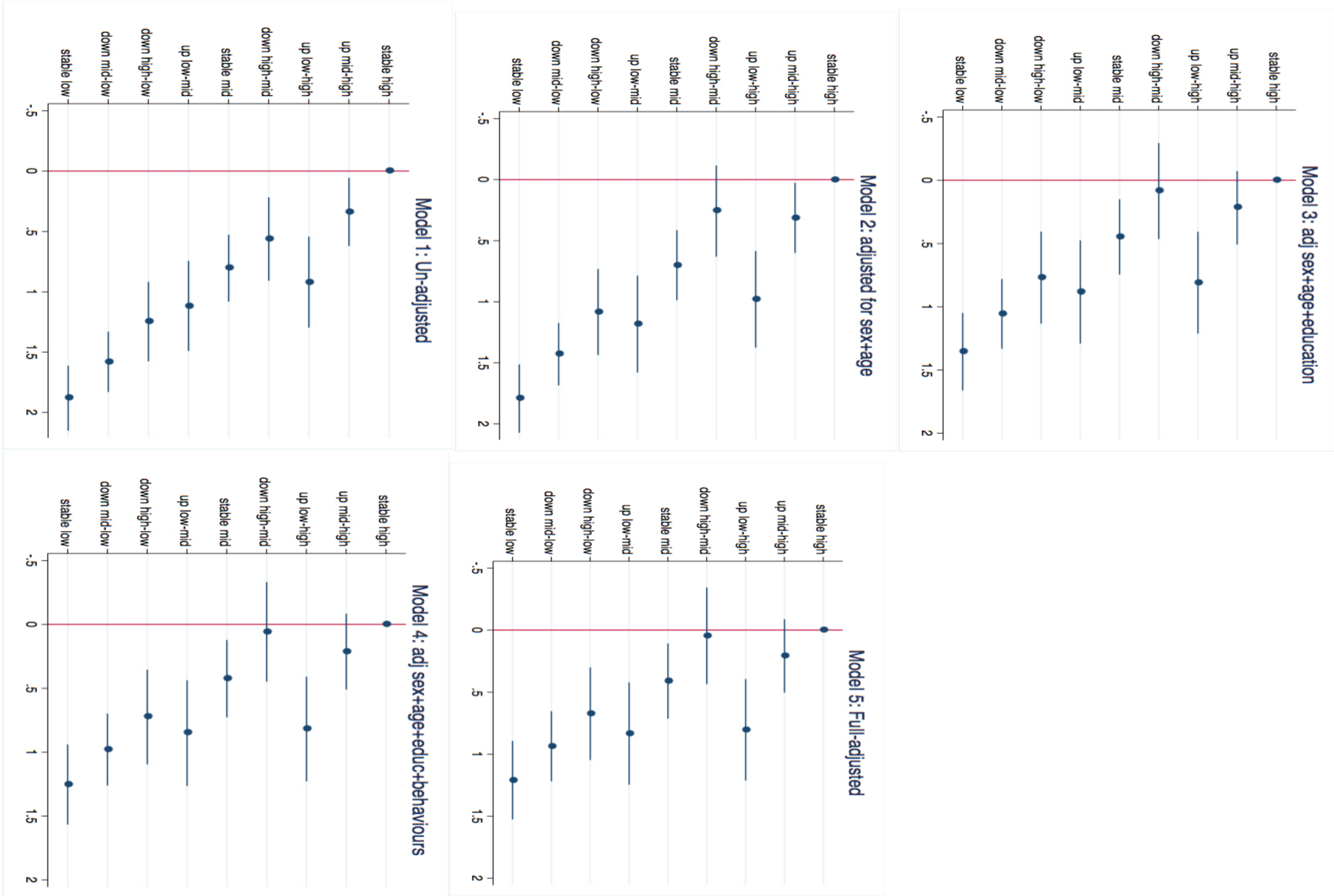


Figure 14. Logistic regression between social trajectories and total tooth loss, sequential models including covariates.

5.3.2 Pattern of association between total tooth loss and social mobility trajectories

Table 23 presents the trajectory groups ordered from the lowest to the highest odds ratio of reporting total tooth loss according the results of fully adjusted model.

From Model 1 to Model 5, a persistent pattern was recognized: the trajectories that shared the same SEPs but had different directions (e.g.: upward mobility from low to high SEP and downward mobility from high to low SEP) were next to each other, suggesting that the association between intergenerational social mobility and total tooth loss is related to an accumulative effect of SEP.

In the fully adjusted model (Model 5) the observed pattern showed the following order from the highest to the lowest OR: at the bottom of the gradient, with the highest OR of reporting total tooth loss, were those individuals that remained stable in the low SEP over time (OR: 3.35 95%CI 2.44-4.60). Above them in the gradient, were those individuals moving between low and middle SEP (downward: OR: 2.55 95%CI 1.92-3.39 and upward: OR: 2.30 95%CI 1.52-3.48). The trajectories moving between low and high SEP were just above in the gradient (upward: OR: 2.23 95%CI 1.48-3.36 and downward: OR: 1.96 95%CI 1.35-2.85). Above these trajectories, were those individuals who remained stable in middle SEP over time (OR: 1.51, 95%CI 1.11-2.04). In an upper position in the gradient, were those individuals moving between middle and high SEP (upward: OR: 1.23 95%CI 0.92-1.66; downward: OR: 1.05 95%CI 0.71-1.55). Lastly, at the top of the gradient, was the stable high SEP group with the lowest OR of reporting total tooth loss (OR: 1.00).

Additionally, all models suggested that levels of total tooth loss of upwardly and downwardly mobile individuals tended to be between the total tooth loss level of stable individuals from the SEP they left and the level of stable individuals from the SEP they joined.

Table 23. Pattern of association between social trajectories and total tooth loss
Ordered from the lowest to the highest OR (95%CI)

	Model 1: Unadjusted model		Model 2: Adjusted for gender+age		Model 3: Adjusted for gender+age+educ		Model 5: Fully adjusted model	
Social Trajectories								
Stable High	1		1		1		1	
Down High-Mid	1.76	(1.24, 2.48)*	1.29	(0.89, 1.88)	1.10	(0.75, 1.59)	1.05	(0.71, 1.55)
Up Mid-High	1.40	(1.06, 1.86)*	1.37	(1.03, 1.82)*	1.24	(0.93, 1.66)	1.23	(0.92, 1.66)
Stable Middle	2.23	(1.69, 2.95)**	2.02	(1.51, 2.68)**	1.56	(1.16, 2.11)*	1.51	(1.11, 2.04)*
Down High-Low	3.48	(2.51, 4.84)**	2.96	(2.08, 4.21)**	2.16	(1.50, 3.11)**	1.96	(1.35, 2.85)**
Up Low-High	2.51	(1.72, 3.66)**	2.66	(1.79, 3.96)**	2.25	(1.50, 3.36)**	2.23	(1.48, 3.36)**
Up Low-Mid	3.06	(2.10, 4.44)**	3.26	(2.20, 4.85)**	2.42	(1.61, 3.64)**	2.30	(1.52, 3.48)**
Down Mid-Low	4.86	(3.78, 6.24)**	4.18	(3.23, 5.39)**	2.88	(2.18, 3.79)**	2.55	(1.92, 3.39)**
Stable Low	6.57	(5.02, 8.60)**	6.01	(4.54, 7.96)**	3.88	(2.85, 5.27)**	3.35	(2.44, 4.60)**

Order from highest to lowest OR based on model 5: the full-adjusted model
M1: unadjusted model: total tooth loss and social trajectories; M2: adjusted for gender and continuous age; M3: adjusted for gender, age and education; M5: fully adjusted model: adjusted for gender, age, education, smoking, physical activity, employment status, marital status and childhood health.
*Cross-sectional weighted values of imputed data; *p-value <0.05; ** p-value <0.001*

5.3.3 Sensitivity analysis: comparison with complete case analysis

The regression analyses conducted with imputed data were repeated using complete case data (Appendix G). Results showed that, compared to the imputed data analysis, the complete case data analysis slightly overestimate the magnitude of the associations between intergenerational social mobility trajectories ant total tooth loss. Although, generally the estimates changed subtly among analyses (complete case data and imputed data).

ORAIL IMPACTS ON DAILY PERFORMANCE

5.4 Oral impacts on daily performance

5.4.1 Association between at least one oral impact on daily performance and social mobility trajectories

Table 24 and Figure 15 present the results of the logistic regression analyses exploring the association between intergenerational social mobility trajectories and at least one oral impact on daily performance with sequential inclusion of covariates (section 3.4.3).

Model 1 explored the unadjusted association between social trajectories and at least one OIDP. Compared to the stable high SEP group, two of the eight social trajectories were significantly more likely to report at least one OIDP. Those individuals that remained stable in the low SEP group over time were 1.60 (95%CI 1.09-2.34) times, and downwardly mobile individuals from middle to low SEP were 1.59 (95%CI 1.14-2.22) times more likely to report at least one oral impact on daily performance.

The inclusion of age, gender and education in Model 3 completely explained the observed associations. The estimated odds ratio decreased and no trajectory remained statistically significant.

Additionally, the estimates were gradually attenuated through the sequential models (Model 4 and Model 5), suggesting that covariates fully explained the association between social mobility trajectories and at least one oral impact on daily performance.

Table 24. Association between social mobility trajectories and at least one oral impact on daily performance (OIDP)
Sequentially adjusted logistic regression models OR (95%CI)
Wave 3 n=8659; At least one oral impact on daily performance (OIDP): 6.4%

	Model 1 OIDP +Social trajectories (Unadjusted model)		Model 2: M1+gender+age		Model 3: M2+education		Model 4: M3+behaviours		Model 5: M4+ES+MS+CH (Full adjusted model)	
Social trajectories										
Stable High	1		1		1		1		1	
Up Mid-High	0.96	(0.68, 1.36)	0.94	(0.66, 1.33)	0.94	(0.67, 1.33)	0.93	(0.65, 1.31)	0.92	(0.65, 1.30)
Up Low-High	1.23	(0.71, 2.13)	1.21	(0.70, 2.09)	1.20	(0.69, 2.08)	1.18	(0.68, 2.06)	1.15	(0.66, 2.02)
Down High-Mid	1.27	(0.80, 1.99)	1.20	(0.76, 1.89)	1.23	(0.78, 1.94)	1.17	(0.74, 1.85)	1.12	(0.71, 1.78)
Stable Middle	1.18	(0.81, 1.71)	1.13	(0.78, 1.65)	1.14	(0.78, 1.68)	1.09	(0.74, 1.59)	1.05	(0.71, 1.53)
Up Low-Mid	1.25	(0.72, 2.17)	1.23	(0.71, 2.13)	1.22	(0.70, 2.14)	1.15	(0.66, 2.01)	1.07	(0.61, 1.89)
Down High-Low	1.52	(0.93, 2.47)	1.45	(0.89, 2.37)	1.42	(0.86, 2.36)	1.29	(0.78, 2.13)	1.11	(0.67, 1.85)
Down Mid-Low	1.59	(1.14, 2.22)*	1.49	(1.06, 2.08)*	1.45	(1.00, 2.10)	1.30	(0.90, 1.86)	1.16	(0.80, 1.68)
Stable Low	1.60	(1.09, 2.34)*	1.49	(1.01, 2.19)*	1.41	(0.92, 2.15)	1.25	(0.81, 1.91)	1.10	(0.72, 1.69)

M1: unadjusted model: association between social mobility trajectories and at least one oral impact on daily performance; M2: adjusted for gender and continuous age; M3: adjusted for gender, age and education; M4: adjusted for gender, age, education, smoking and physical activity; M5: full adjusted model: adjusted for gender, age, education, smoking, physical activity, employment status, marital status and childhood health.
*Cross-sectional weighted values of imputed data; *p-value <0.05; ** p-value <0.001*

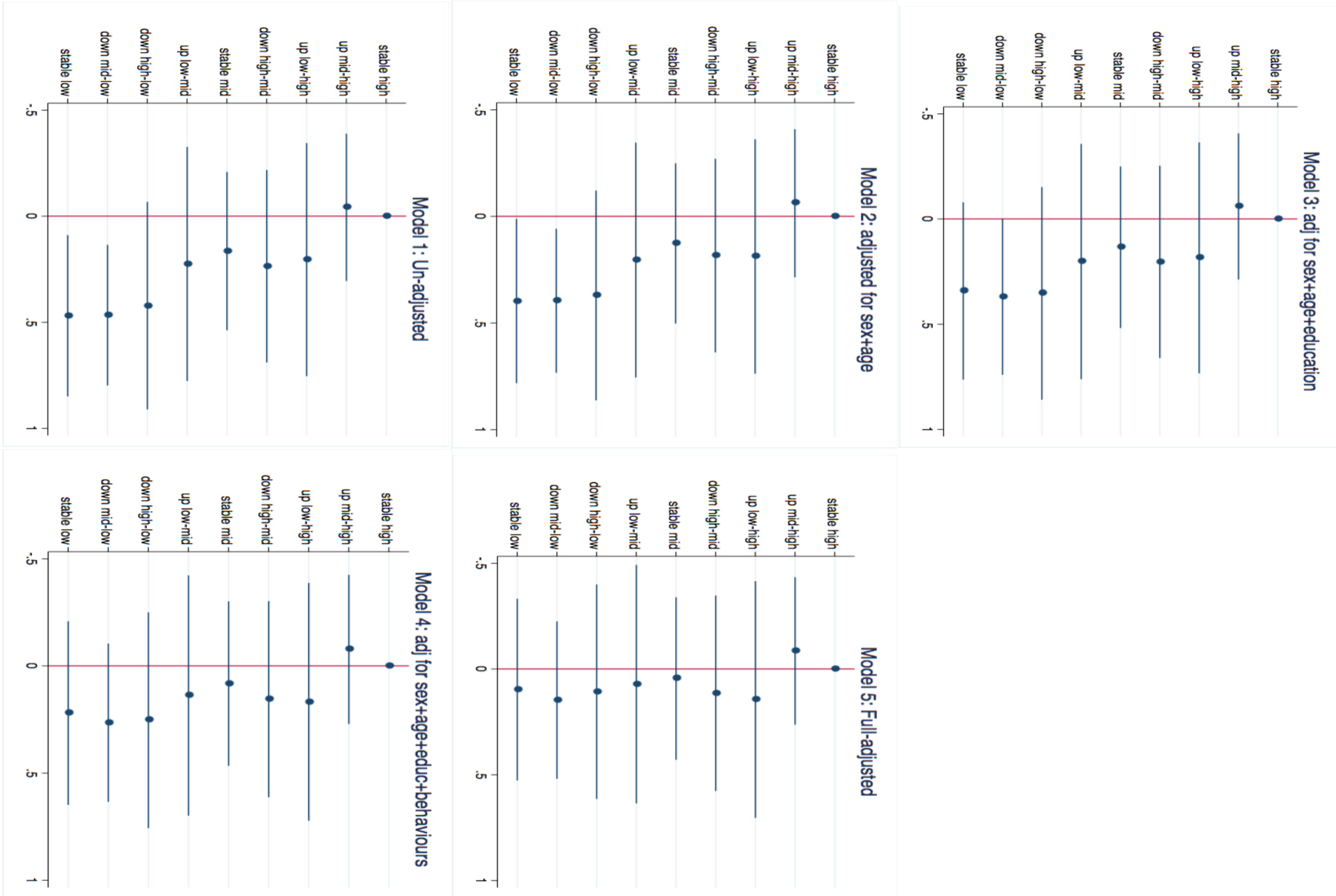


Figure 15. Logistic regression between social trajectories and oral impacts on daily performance, sequential models including covariates.

5.4.2 Pattern of association between at least one oral impact on daily performance and social mobility trajectories

Table 25 displays the odds ratios of the association between social mobility trajectories and at least one OIDP ordered from the lowest OR to the highest OR based on the fully adjusted model.

From Model 1 to Model 4, a persistent pattern related to adult SEP was observed. Those with low adult SEP had the highest likelihood of reporting at least one OIDP, those with high adult SEP had the lowest likelihood, and hose trajectories with middle SEP had an intermediate position within the gradient.

However, at model 5 the pattern changed. After full adjustment, no clear pattern can be easily interpreted. The gradient is not related to adult SEP, child SEP or an accumulative effect of SEP. Moreover, the ORs for all trajectories were very close to 1, suggesting no graded association between social trajectories and OIDP after adjustment for covariates.

Table 25. Pattern of association between social trajectories and oral impacts on daily performance
Ordered from the lowest to the highest OR (95%CI)

	Model 1: Unadjusted model		Model 3: Adjusted for gender+age+education		Model 5: Fully adjusted model	
Social Trajectories						
Stable High	1		1		1	
Up Mid-High	0.96	(0.68, 1.36)	0.94	(0.67, 1.33)	0.92	(0.65, 1.30)
Stable Middle	1.18	(0.81, 1.71)	1.14	(0.78, 1.68)	1.05	(0.71, 1.53)
Up Low-Mid	1.25	(0.72, 2.17)	1.22	(0.70, 2.14)	1.07	(0.61, 1.89)
Stable Low	1.60	(1.09, 2.34)*	1.41	(0.92, 2.15)	1.10	(0.72, 1.69)
Down High-Low	1.52	(0.93, 2.47)	1.42	(0.86, 2.36)	1.11	(0.67, 1.85)
Down High-Mid	1.27	(0.80, 1.99)	1.23	(0.78, 1.94)	1.12	(0.71, 1.78)
Up Low-High	1.23	(0.71, 2.13)	1.20	(0.69, 2.08)	1.15	(0.66, 2.02)
Down Mid-Low	1.59	(1.14, 2.22)*	1.45	(1.00, 2.10)	1.16	(0.80, 1.68)

Order from highest to lowest OR based on model 5: the full-adjusted model
M1: unadjusted model: association between social mobility trajectories and at least one oral impact on daily performance; M3: adjusted for gender, age and education; M5: full adjusted model: adjusted for gender, age, education, smoking, physical activity, employment status, marital status and childhood health.
*Cross-sectional weighted values of imputed data; *p-value <0.05; ** p-value <0.001*

5.4.3 Sensitivity analysis: comparison with complete case analysis

The regression analysis presented in the previous section was repeated using complete case data instead of imputed data (Appendix G). Comparing with the imputed data analysis, the complete case analysis showed similar results. There is no statistical evidence supporting the existence of a gradient in either the imputed or the complete case analysis.

GRIP STRENGTH

5.5 Grip Strength

5.5.1 Association between maximum grip strength measurement and social mobility trajectories

Table 26 and Figure 16 displays the results of the linear regression analyses exploring the association between intergenerational social mobility trajectories and grip strength with sequential inclusion of covariates (section 3.4.3).

Model 1 explored the unadjusted association between social mobility trajectories and mean grip strength. This model suggested that compared to the stable high SEP group, seven out of the eight social trajectories were significantly more likely to have lower measurements of grip strength, suggesting a graded pattern.

The addition of gender and age (Model 2) partially explained these associations. Most of the estimated coefficients increased, implying that the differences in grip strength by social trajectories were lower when age and gender were considered.

The inclusion of education in Model 3 substantially attenuated the association between social mobility and grip strength. The estimates of all trajectories increased by 32% to 81%.

These association were slightly affected by the inclusion of behaviours in Model 4.

After full adjustment (Model 5), an association between intergenerational social mobility trajectories and grip strength persisted. Those trajectories with low adult SEP were significantly more likely to have lower grip strength measurements. Compared to the stable high SEP group, those individuals moving downward from high to low SEP had 1.11 kg (95%CI -2.07, -0.14) lower, those moving downward from middle to low SEP had 1.16 kg (95%CI -1.86, -0.46) lower, and those individuals that remained stable in the low SEP over time had 1.44 kg (95%CI -2.31, -0.57) lower grip strength.

Table 26. Association between social mobility trajectories and grip strength
Sequentially adjusted linear regression models coefficients (95%CI)
Wave 4 n=9805
Mean grip strength = 31.0 kg (SD=13.7)

	Model 1 GS +Social trajectories (Unadjusted model)		Model 2: M1+gender+age		Model 3: M2+education		Model 4: M3+behaviours		Model 5: M4+ES+MS+CH (Full adjusted model)	
Social trajectories										
Stable High	0		0		0		0		0	
Up Mid-High	-0.44	(-1.32, 0.43)	-0.85	(-1.43, -0.27)*	-0.60	(-1.18, -0.02)*	-0.57	(-1.15, 0.00)	-0.53	(-1.10, 0.04)
Up Low-High	-1.55	(-3.15, -0.01)*	-1.12	(-2.13, -0.11)*	-0.68	(-1.69, 0.32)	-0.65	(-1.66, 0.36)	-0.63	(-1.64, 0.37)
Down High-Mid	-2.57	(-3.79, -1.35)**	-0.55	(-1.30, 0.20)	-0.10	(-0.86, 0.66)	-0.02	(-0.80, 0.73)	0.04	(-0.71, 0.79)
Stable Middle	-2.76	(-3.77, -1.76)**	-1.20	(-1.86, -1.55)**	-0.54	(-1.23, 0.15)	-0.46	(-1.15, 0.22)	-0.38	(-1.06, 0.29)
Up Low-Mid	-2.09	(-3.72, -0.46)*	-1.02	(-2.16, 0.13)	-0.22	(-1.36, 0.93)	-0.06	(-1.20, 1.07)	0.08	(-1.04, 1.20)
Down High-Low	-5.42	(-6.85, -4.00)**	-2.29	(-3.25, -1.32)**	-1.54	(-2.52, -0.57)*	-1.41	(-2.37, -0.44)*	-1.11	(-2.07, -0.14)*
Down Mid-Low	-5.11	(-6.05, -4.17)**	-2.56	(-3.20, -1.92)**	-1.63	(-2.32, -0.93)**	-1.41	(-2.10, -0.72)**	-1.16	(-1.86, -0.46)*
Stable Low	-5.58	(-6.73, -4.42)**	-3.18	(-3.99, -2.36)**	-2.15	(-3.03, -1.27)**	-1.81	(-2.69, -0.94)**	-1.44	(-2.31, -0.57)*

M1: unadjusted model: association between social mobility trajectories and grip strength; M2: adjusted for gender and continuous age; M3: adjusted for gender, age and education; M4: adjusted for gender, age, education, smoking and physical activity; M5: full adjusted model: adjusted for gender, age, education, smoking, physical activity, employment status, marital status and childhood health.
*Cross-sectional weighted values of imputed data; *p-value <0.05; ** p-value <0.001*

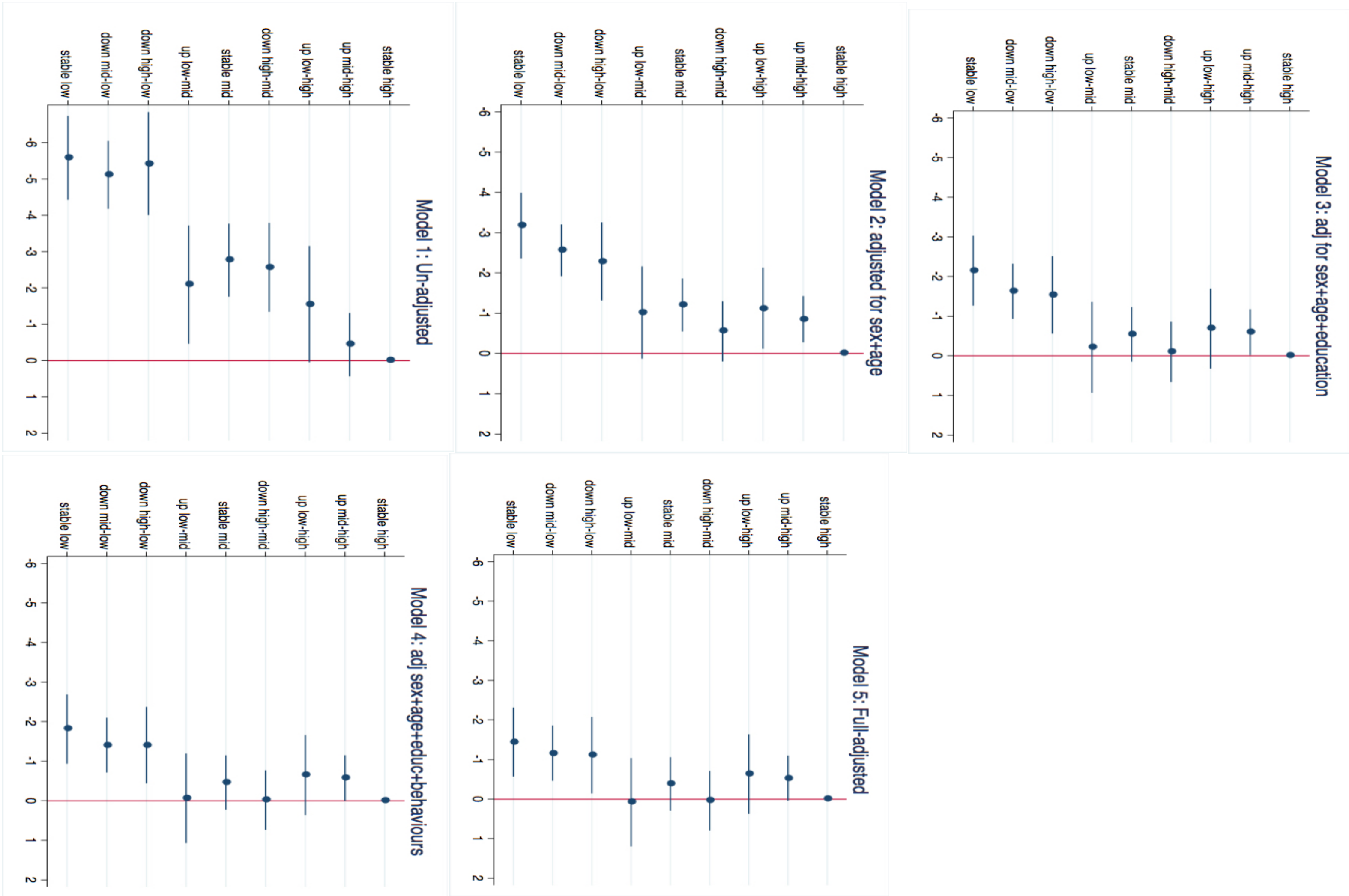


Figure 16. Linear regression between social trajectories and grip strength, sequential models including covariates.

5.5.2 Pattern of association between maximum grip strength and social mobility trajectories

To observe the pattern of association, the trajectories were ordered from the lowest coefficient to the highest coefficient of mean grip strength measurements according the results of the fully adjusted model (Table 27).

In model 1 and model 2 a pattern associated with adult SEP was observed. In model 3, the inclusion of education caused an important change on the pattern of association. From model 3 to model 5, although not all the trajectories were statistically significant, the same gradient persisted. In this case, the gradient did not show a pattern suggesting an accumulative effect of SEP. This pattern is not easily to interpret.

The fully adjusted model (Model 5) showed a gradient with the following order: at the bottom of the gradient with the lowest grip strength were the trajectories with adult low SEP; in an intermediate position were the trajectories moving upwardly to adult high SEP, and the stable middle SEP trajectory; at the top of the gradient with the highest grip strength were those trajectories moving upwardly and downwardly to adult middle SEP and the trajectory stable high SEP.

Additionally, differently from the previous outcomes, these results did not support that grip strength measurements of upwardly and downwardly mobile individuals tended to be between the grip strength levels of the stable individuals from SEP they left and the levels of the stable individuals from SEP they joined.

Table 27. Pattern of association between social trajectories and grip strength
Ordered from the lowest to the highest ß Coefficient (95%CI)

	Model 1: Unadjusted model		Model 2: Adjusted for gender+age		Model 3: Adjusted for gender+age+educ		Model 5: Fully adjusted model	
Social Trajectories								
Stable High	0		0		0		0	
Up Low-Mid	-2.09	(-3.72, -0.46)*	-1.02	(-2.16, 0.13)	-0.22	(-1.36, 0.93)	0.08	(-1.04, 1.20)
Down High-Mid	-2.57	(-3.79, -1.35)**	-0.55	(-1.30, 0.20)	-0.10	(-0.86, 0.66)	0.04	(-0.71, 0.79)
Stable Middle	-2.76	(-3.77, -1.76)**	-1.20	(-1.86, -1.55)**	-0.54	(-1.23, 0.15)	-0.38	(-1.06, 0.29)
Up Mid-High	-0.44	(-1.32, 0.43)	-0.85	(-1.43, -0.27)*	-0.60	(-1.18, -0.02)*	-0.53	(-1.10, 0.04)
Up Low-High	-1.55	(-3.15, -0.01)*	-1.12	(-2.13, -0.11)*	-0.68	(-1.69, 0.32)	-0.63	(-1.64, 0.37)
Down High-Low	-5.42	(-6.85, -4.00)**	-2.29	(-3.25, -1.32)**	-1.54	(-2.52, -0.57)*	-1.11	(-2.07, -0.14)*
Down Mid-Low	-5.11	(-6.05, -4.17)**	-2.56	(-3.20, -1.92)**	-1.63	(-2.32, -0.93)**	-1.16	(-1.86, -0.46)*
Stable Low	-5.58	(-6.73, -4.42)**	-3.18	(-3.99, -2.36)**	-2.15	(-3.03, -1.27)**	-1.44	(-2.31, -0.57)*

Order from highest to lowest OR based on model 5: the full-adjusted model
M1: unadjusted model: association between social mobility trajectories and grip strength; M2: adjusted for gender and continuous age; M3: adjusted for gender, age and education; M5: full adjusted model: adjusted for gender, age, education, smoking, physical activity, employment status, marital status and childhood health.
*Cross-sectional weighted values of imputed data; *p-value <0.05; ** p-value <0.001*

5.5.3 Sensitivity analysis: comparison with complete data analysis

The regression analysis presented in this section, conducted using imputed data was repeated but using complete case data. The results of the complete data analysis for the association between intergenerational social mobility trajectories and grip strength are displayed in Appendix G.

Results showed that the complete case analysis underestimate the magnitude of the estimates compared to the imputed data analysis. However, the association between social mobility and adult grip strength generally showed the same direction.

5.6 Stratification and interaction

The multiple regression analysis (chapter 5) revealed statistically significant associations between gender and all outcomes, except for oral impacts on daily performance (Appendix F, Table 54). Women were less likely to report poor self-rated general health (Appendix F, Table 45), poor self-rated oral health (Appendix F, Table 51), were more likely to report total tooth loss (Appendix F, Table 48), and had lower grip strength measurement (Appendix F, Table 57) than men, even after full adjustment. Based on these results, the fully adjusted models of these outcomes were fitted stratified by gender.

Additionally, owing to the wide age range of the sample (section 3.4.3.1), and the observed moderating role of age in the relationship between social mobility and self-rated oral health (Appendix F, Table 48), total tooth loss (Appendix F, Table 51) and grip strength (Appendix F, Table 57), the interaction of age in its continuous form with the social trajectories was also tested in these outcomes.

Moreover, based on the consideration explained in the methodology chapter about expected differences among trajectories by total tooth loss in this cohort (section 3.4.3.1), interaction between total tooth loss (dentate/edentate) and intergenerational social trajectories was examined.

5.6.1 Stratification by gender

Table 28 presents results stratified by gender. Appendix H contains the complete stratification tables including all the odds ratios and coefficients for the fully adjusted models.

The stratification analysis showed no differences between gender in the associations between intergenerational social mobility and self-rated general health, self-rated oral health and total tooth loss. However, the association between social mobility and grip strength varied significantly between women and men (Table 28, Figure 17, Figure 18). Among men, no significant association between social mobility trajectories and grip strength was found after full adjustment for covariates. However, among women six of the eight trajectory groups were significantly associated with grip strength. Additionally, the coefficients were larger for women than men. Furthermore, the pattern of association was very different among gender. Among men the pattern was associated with adult SEP. However, among women the gradient is complex to interpret with no clear pattern neither associated with an accumulative effect of SEP nor with adult SEP, even so, there is a slightly suggestion of a cumulative effect of SEP, however this is not straightforward (Table 29).

Specifically, among women, after full adjustment, compared to the stable high SEP group, women remaining stable in the low SEP had 1.67 kg (95%CI -2.66, -0.69), those women moving downward from middle to low SEP had 1.60 kg (95%CI -2.42, -0.77), those moving upward from low to high SEP had 1.38 kg (95%CI -2.54, -0.22), those moving downward from high to low SEP had 1.34 kg (95%CI -2.38, -0.29), those moving upward from middle to high SEP had 0.99 kg (95%CI -1.66, -0.32), and those remaining stable in middle SEP over time had 0.81 kg (95%CI 1.59, -0.04) lower grip strength.

Table 28. Fully adjusted regression between general health, oral health and physical function stratified by gender

	Self-rated Health Poor/fair		Self-rated Oral Health Poor/fair		Total Tooth Loss		Mean Grip Strength	
Stratified by gender: **Men** w3 n=3877 w4 n=4398								
	33.2%		20.6%		15.1%		Mean (SD)= 39.6 (11.4)	
Stable High	1		1		1		0	
Up Mid-High	1.11	(0.82, 1.49)	0.79	(0.58, 1.07)	1.31	(0.83, 2.06)	-0.17	(-1.09, 0.74)
Up Low-High	1.35	(0.86, 2.12)	0.88	(0.54, 1.43)	2.98	(1.64, 5.43)**	-0.02	(-1.58, 1.53)
Down High-Mid	1.14	(0.76, 1.70)	1.14	(0.77, 1.70)	1.38	(0.76, 2.50)	0.70	(-0.69, 2.02)
Stable Middle	1.37	(0.99, 1.86)	1.00	(0.71, 1.41)	1.85	(1.16, 2.94)*	-0.01	(-1.16, 1.15)
Up Low-Mid	1.50	(0.95, 2.39)	1.10	(0.68, 1.78)	2.66	(1.47, 4.80)*	1.08	(-0.82, 2.99)
Down High-Low	1.32	(0.85, 2.06)	0.87	(0.51, 1.48)	2.47	(1.28, 4.75)*	-1.03	(-2.70, 0.63)
Down Mid-Low	1.55	(1.14, 2.10)*	1.11	(0.80, 1.53)	2.76	(1.78, 4.27)**	-0.73	(-1.89, 0.43)
Stable Low	2.13	(1.49, 3.05)**	0.98	(0.68, 1.42)	4.00	(2.48, 6.47)**	-1.21	(-2.61, 0.19)
Stratified by gender: **Women** w3 n=4782 w4 n=5407								
	34.0%		17.7%		20.3%		Mean (SD)= 23.1 (9.1)	
Stable High	1		1		1		0	
Up Mid-High	1.07	(0.82, 1.40)	0.85	(0.63, 1.14)	1.21	(0.82, 1.78)	-0.99	(-1.66, -0.32)*
Up Low-High	1.26	(0.82, 1.92)	0.70	(0.42, 1.17)	1.72	(0.96, 3.07)	-1.38	(-2.54, -0.22)*
Down High-Mid	0.99	(0.70, 1.40)	0.75	(0.51, 1.11)	0.87	(0.52, 1.43)	-0.63	(-1.51, 0.25)
Stable Middle	1.08	(0.80, 1.44)	0.86	(0.63, 1.19)	1.29	(0.86, 1.93)	-0.81	(-1.59, -0.04)*
Up Low-Mid	1.46	(0.96, 2.23)	0.79	(0.48, 1.30)	2.05	(1.17, 3.61)*	-0.82	(-2.03, 0.39)
Down High-Low	1.60	(1.13, 2.26)*	1.05	(0.70, 1.57)	1.64	(1.02, 2.62)*	-1.34	(-2.38, -0.29)*
Down Mid-Low	1.82	(1.38, 2.41)**	1.02	(0.75, 1.40)	2.35	(1.61, 3.43)**	-1.60	(-2.42, -0.77)**
Stable Low	2.38	(1.72, 3.28)**	0.99	(0.68, 1.43)	2.88	(1.90, 4.37)**	-1.67	(-2.66, -0.69)*

Model 5: fully adjusted model: association between social trajectories and outcomes adjusted for gender, age, education, smoking, physical activity, employment status, marital status and childhood health.
*Cross-sectional weighted values of imputed data; *p-value <0.05; ** p-value <0.001*

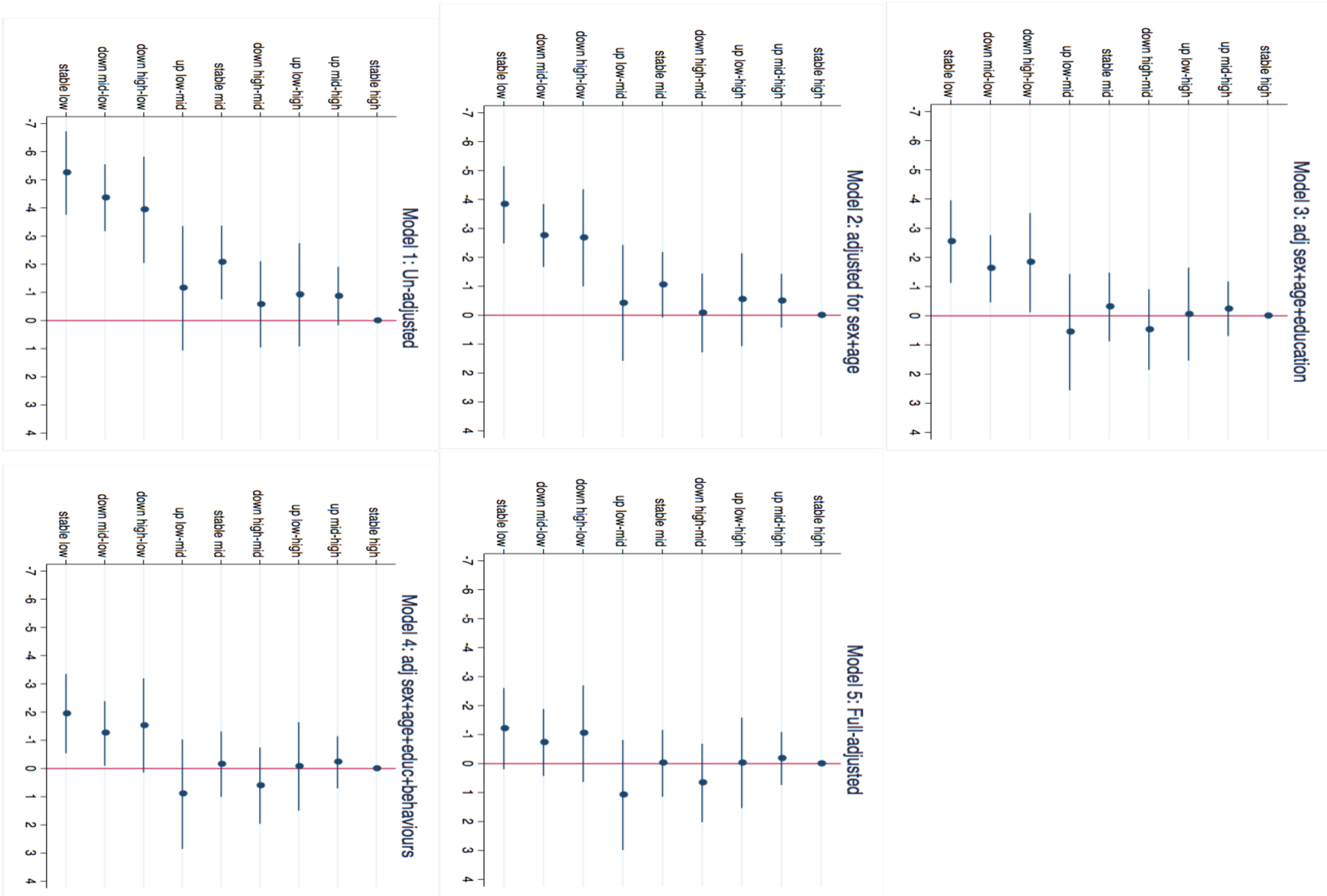


Figure 17. Men strata: Linear regression between social trajectories and grip strength, sequential models including covariates.

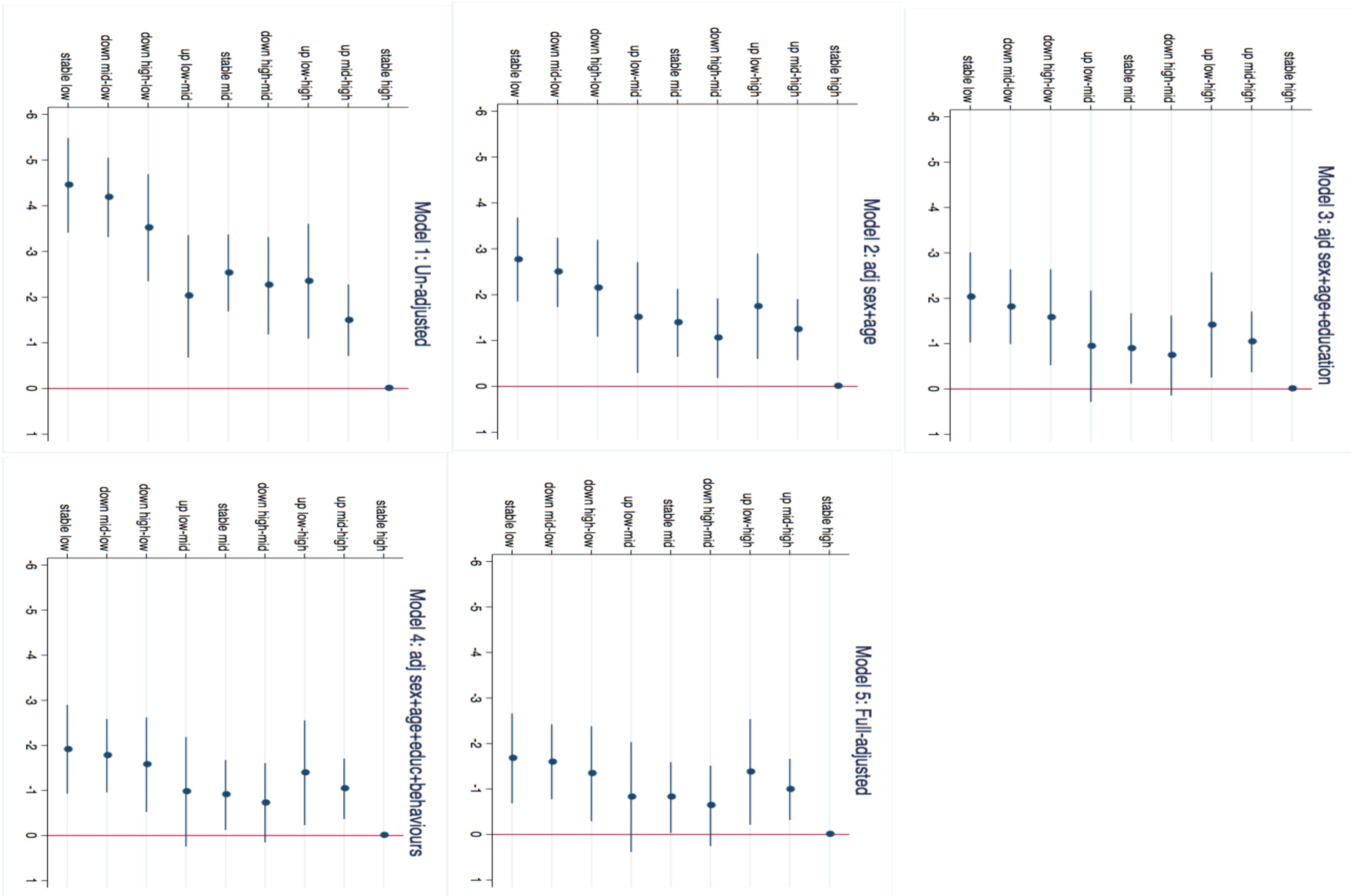


Figure 18. Women strata: Linear regression between social trajectories and grip strength, sequential models including covariates.

Table 29. Pattern of association between social trajectories and grip strength among women.
Ordered from the lowest to the highest ß Coefficient (95%CI)
Women: Mean grip strength Kg (SD)= 23.1 (9.1)

	Women strata w4 n=5407	
Social trajectories		
Stable High	0	
Down High-Mid	-0.63	(-1.51, 0.25)
Stable Middle	-0.81	(-1.59, -0.04)*
Up Low-Mid	-0.82	(-2.03, 0.39)
Up Mid-High	-0.99	(-1.66, -0.32)*
Down High-Low	-1.34	(-2.38, -0.29)*
Up Low-High	-1.38	(-2.54, -0.22)*
Down Mid-Low	-1.60	(-2.42, -0.77)**
Stable Low	-1.67	(-2.66, -0.69)*

Order based on model 5: the full-adjusted model
Cross-sectional weighted values of imputed data
**p-value <0.05; ** p-value <0.001*

5.6.2 Interaction between social mobility trajectories and age

No statistical significant interaction between intergenerational social trajectories and age was observed for any of the outcomes. In other words, there was no statistical evidence that the association between intergenerational social mobility and self-rated oral health, total tooth loss and grip strength differed by age (Table 30).

Table 30. Interaction term between social trajectories and continuous age

	Self-rated oral health Poor/fair		Edentulousness		Mean grip Strength	
	w3 n=8659 OR (95% C.I)				w4 n=9805 Coef (95% C.I)	
Stable High*age	1		1		0	
Up Mid-High*age	1.00	(0.97, 1.02)	0.98	(0.95, 1.01)	-0.07	(-0.15, 0.01)
Down High-Mid*age	1.00	(0.97, 1.04)	0.97	(0.93, 1.01)	0.01	(-0.10, 0.12)
Up Low-High*age	0.99	(0.96, 1.02)	0.97	(0.94, 1.01)	-0.05	(-0.15, 0.05)
Stable Middle*age	0.99	(0.97, 1.02)	0.98	(0.94, 1.01)	-0.10	(-0.19, -0.01)
Up Low-Mid*age	0.98	(0.94, 1.02)	0.97	(0.93, 1.01)	-0.04	(-0.16, 0.09)
Down High-Low*age	1.00	(0.97, 1.02)	0.97	(0.93, 1.01)	-0.01	(-0.13, 0.11)
Down Mid-low*age	1.00	(0.97, 1.02)	0.99	(0.96, 1.02)	-0.09	(-0.18, -0.01)
Stable Low*age	0.98	(0.95, 1.01)	0.99	(0.96, 1.03)	-0.04	(-0.13, 0.06)

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001.*

5.6.3 Interaction between social mobility trajectories and total tooth loss

There is no statistical evidence that the association between intergenerational social trajectories and self-rated oral health and oral impacts on daily performance differed between dentate and edentate respondents (Table 31).

Table 31. Interaction term between social trajectories and total tooth loss

	Self-rated oral health Poor/fair		Oral impacts on daily performance	
	w3 n=8659 OR (95% C.I)			
Stable High*tooth loss	1		1	
Up Mid-High*tooth loss	0.46	(0.15, 1.49)	1.56	(0.42, 5.75)
Down High-Mid*tooth loss	1.11	(0.32, 3.89)	0.94	(0.18, 4.83)
Up Low-High*tooth loss	0.55	(0.14, 2.22)	0.37	(0.06, 2.34)
Stable Middle*tooth loss	0.99	(0.35, 2.79)	0.93	(0.23, 3.78)
Up Low-Mid*tooth loss	0.85	(0.26, 2.79)	1.48	(0.29, 7.53)
Down High-Low*tooth loss	1.17	(0.36, 3.79)	2.03	(0.42, 9.84)
Down Mid-low*tooth loss	0.88	(0.34, 2.28)	0.81	(0.23, 2.92)
Stable Low*tooth loss	0.52	(0.19, 1.44)	0.84	(0.23, 3.08)

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001.*

5.7 Multiple regression analysis: summary of main findings

The objective of this chapter was to assess the association between intergenerational social mobility trajectories and five general health, oral health and physical function outcomes, among individuals living in England aged 50 years old and over.

The findings on this chapter revealed that intergenerational social mobility trajectories were associated with all five outcomes. Covariates attenuated these associations. The analysis identified education as the covariate that exerted the greatest impact. Most of the associations between social trajectories and the outcomes reduced when education was accounted, suggesting that education is a relevant part of the pathway linking intergenerational social mobility and general health, oral health and physical function at older adulthood.

There was evidence of an association between intergenerational social mobility trajectories and self-rated general health, total tooth loss among men and women, and grip strength only among women even after full adjustment. However, the associations between intergenerational social mobility trajectories and self-rated oral health, and at least one oral impact on daily performance were completely explained by covariates.

The full-adjusted association between intergenerational social mobility trajectories and self-rated general health, and total tooth loss showed a gradient related to accumulative effect of SEP. The pattern of association was different for grip strength, being more complex to interpret, although a cumulative effect of SEP is slightly suggested.

Lastly, the stratification analysis revealed a different association between social trajectories and grip strength between men and women. Among women, intergenerational social mobility trajectories were associated with grip strength measurements even after full adjustment for covariates. But, there was no statistically significant difference in grip strength by social trajectories among men.

CHAPTER 6

STRUCTURAL EQUATION MODELLING

6 Effect of social causation and health selection theories: Structural equation modelling (SEM)

The scope of this chapter is to examine and compare the importance of health selection and social causation theories, aiming to understand how well each theory is supported by the data, assessing the fourth objective of this thesis. Each of these social mobility theories explores one direction of the association between socioeconomic position and health and function. Social causation explores how SEP affects health, and health selection explores how health affects SEP. SEM analyses were conducted to assess both pathways simultaneously.

As mentioned in the methodology chapter (section 3.4.4.2), series of SEM models were constructed for each of the five outcome variables separately. These models included childhood SEP, adult SEP, childhood health and the mediators (education and health-related behaviour). Additionally, all models were adjusted by age, gender, employment and marital status. The diagonal arrow from childhood SEP to adult health reflects the social causation path; and from child health to adult SEP reflects the health selection path. The size of these paths gives the relative contribution of each theory on the association between health and SEP.

It has been hypothesised that the influence of childhood SEP on adult health and physical function (social causation theory) is both, direct and indirect through education and health related behaviours. Also, it has been hypothesised that the influence of childhood health on adult SEP (health selection theory) is direct but also indirect via education. Therefore, the first model accounts for the direct effect between health and SEP, without accounting for other variables. A second model was conducted adding education as a mediating factor.

Finally, a third and fourth model (named models 3.1 and 3.2) added two separate health related behaviours (smoking and physical function respectively).

The variables were coded in such way that a higher value was indicative of a lower the SEP, lower education level, poorer health or poorer behaviour. Specifically, for childhood and adulthood SEP a higher category value was indicative of a lower SEP (high=1, middle=2, low=3). For childhood and adult general health/oral health, a higher value was indicative of poor health (0=good health, 1=poor health). For education level, a higher category value was indicative of lower educational level (high qualification=1, secondary qualification=2, no-qualification=3). For smoking status, a higher category value was indicative of a less healthy smoking behaviour (1=never smoke, 2=ex-smoker, 3=smoker). For physical activity, a higher category value was indicative of a less healthy activity behaviour (0=active, 1=non-active). Finally, grip strength was coded differently. This is a continuous variable measuring kilograms; a higher score was indicative of higher grip strength, indicating better physical function.

The following SEM Tables and Figures report the standardized estimates to allow comparisons between the pathways. For simplicity, only the standardized estimates of the regressions are presented in the Figures. The standard errors and p-values of each estimate can be found on Appendix I.

All SEM models of this study had an excellent fit to the data with RMSEA values below 0.05 and a CFI values above 0.95 (Browne & Cudeck 1993; Kline 2011)(Appendix I, Table 90).

6.1 SEM: Self-rated general health

Table 32 displays the regression standardized estimates of the social causation and health selection direct and indirect pathways.

Model 1 is illustrated by Figure 19, showing the cross-lagged pathways between childhood and adult SEP and health. All standardized path estimates were statistically significant. The social causation direct path (diagonal arrow: child SEP→adult health) suggested that childhood SEP has an influence on adult self-rated general health, lower SEP in childhood was indicative of poor adult general health (regress coef: 0.155, p<0.001). Also, the health selection direct path estimate (diagonal arrows child health→adult SEP) suggested that childhood health has an influence on adult SEP, poor health was indicative of lower adult SEP (regress coef: 0.045, p=0.002). Additionally, this figure shows that the social causation direct path standardized estimate was larger than the estimate for the health selection direct path (about three times larger).

Model 2 is illustrated by Figure 20, showing the cross-lagged panel including education. It was hypothesised that the mechanism through which SEP and health affect each other is via education. Therefore, reductions in the magnitude of the direct path estimates between health and SEP would confirm this hypothesis. In fact, the inclusion of education attenuated the direct effect estimates of both paths, health selection (child health→adult SEP) (regress coef: 0.031, p=0.012) and social causation (child SEP→adult health) (regress coef: 0.069 p<0.001). Moreover, the social causation indirect path via education (child SEP→education level→adult health) suggested that lower childhood SEP was indicative of lower educational level and in turn lower education was indicative of poor adult self-rated general health (regress coef: 0.086, p<0.001); confirming a direct and indirect effect via education of child SEP on adult health (social causation). However, although the inclusion of education attenuated the health selection direct path estimate (child health→adult SEP), there is no statistical evidence confirming a direct effect of childhood health on education level (regress coef: 0.024, p=0.073). Even so, there is strong evidence of a direct effect of childhood health on adult SEP and a suggestion of an indirect effect of child health on adult SEP via education (health selection).

Figure 21 and Figure 22 illustrate model 3.1 and model 3.2 including smoking and physical activity respectively. Compared to the estimates of the other paths, smoking and physical activity had a strong significant direct effect on adult self-rated general health (smoking: regress coef: 0.108, p-value<0.001; physical activity: regress coef: 0.357, p-value<0.001) revealing that smoking and no regular physical activity were indicative of poor general health at older adulthood.

Model 3.1 tested the hypothesis that the mechanism through which childhood SEP affect adult health (social causation) is in part through the effect that childhood SEP has on education and/or smoking status. Therefore, reductions in the magnitude of the direct path and indirect path via education after the inclusion of smoking into the model would confirm this hypothesis. In this model, all standardized estimates were statistically significant excepting the path going from childhood health to education and the path going from education to smoking status. The inclusion of smoking caused a slight attenuation of the estimates of the social causation direct (regress coef: 0.063, p<0.001) and indirect paths via education (regress coef: 0.083, p<0.001). Additionally, this model suggested three social causation indirect pathways via smoking. The first indirect path via smoking specifies that lower childhood SEP was indicative of less healthy smoking behaviour, which in turn was indicative of poor adult health (child SEP→ smoking status→adult health). The second path suggested that lower childhood SEP was indicative of lower adult SEP, which in turn was indicative of a less healthy smoking behaviour, which in turn was indicative of poor adult self-rated health (child SEP→adult SEP→smoking status→adult health). The third path suggested that that lower childhood SEP was indicative of lower educational level, which in turn was indicative of lower adult SEP, which in turn was indicative of a less healthy smoking behaviour, which in turn was indicative of poor adult self-rated health (child SEP→education→adult SEP→smoking status→adult health). Table 32 presents the standardized estimates of these indirect pathways via smoking. All them were statistically significant: suggesting that lower childhood SEP was associated with poor adult general health through smoking. These results confirm a direct and indirect effect via education and smoking of childhood SEP on adult self-rated general health.

Model 3.2 included physical activity instead of smoking. This model tested the hypothesis that no regular physical activity is associated with lower SEP and poor health being other indirect mechanism mediating the association between SEP and health. The inclusion of physical activity into the model had a modest effect on the estimates of the direct and indirect paths via education. Specifically, the estimate of social causation direct path (child SEP→adult health) increased (regress coef: 0.072, p<0.001) and the indirect path via education (child SEP→education→adult health) decreased (regress coef: 0.060, p<0.001). This changes in the magnitude of the estimates of the direct path and indirect path via education support the hypothesis that physical activity partially mediates the direct and indirect effect of childhood SEP on adult health. Moreover, all the pathways in this model had statistically significant estimates excepting the path going from childhood SEP to physical activity, suggesting three indirect pathways via physical activity. First, lower childhood SEP was indicative of lower educational level, which in turn was indicative of no regular physical activity, which was indicative of poor adult health (child SEP→education→physical activity→adult health). The second indirect path via physical activity includes adult SEP, lower childhood SEP was indicative of lower adult SEP, which in turn was indicative of no regular physical activity, which was indicative of poor adult health (child SEP→adult SEP→physical activity→adult health). The third path includes education and adult SEP, lower childhood SEP was indicative of lower educational level, which in turn was indicative of lower adult SEP, which in turn was indicative of no regular physical activity, which was indicative of poor adult health (child SEP→education→adult SEP→physical activity→adult health). The estimates of these social causation indirect pathways were statistically significant, confirming that physical activity had a mediation role, and supporting that childhood SEP has a direct and indirect effect via education and physical activity on adult general health.

Summarizing, these models support that both social mobility theories co-exist. There is strong statistical evidence of a direct effect of childhood health on adult SEP (health selection) and moderate evidence of an indirect effect through education. Additionally, there is strong statistical evidence of a direct effect and indirect effect through education and behaviours of childhood SEP on adult self-rated general health (social causation).

In addition, all models generally suggested that adult SEP and adult heath are statistically significantly correlated, implying that lower SEP at adulthood was associated with poor self-rated adult general health. Also, child SEP influenced adult SEP and child health influenced adult health in the expected direction. Additionally, the pathways from education to adult health and adult SEP were statistically significant and larger than the estimates of other paths in the models, suggesting a relevant effect of education on adult health and SEP in the expected direction. However, the direct effect of education on adult SEP was larger than the effect on adult health.

Table 32. SEM social causation and health selection direct and indirect pathways standardized estimates (S.E) for adult poor self-rated general health.

Wave 3 n=8659

	Model 1	
Direct Paths	Social causation direct path	.155 (.015)**
	Health selection direct path	.045 (.014)*
	Model 2	
Direct Paths	Social causation direct path	.069 (.016)**
	Health selection direct path	.031 (.013)*
Indirect paths via education	SC: Child SEP>education>adult health	.086 (.006)**
	HS: Child SRH>education>adult SEP	.013 (.007)
	Social causation total effect	.155**
	Health selection total effect	.044*
	Model 3.1 including smoking	
Direct Paths	Social causation direct path	.063 (.016)**
	Health selection direct path	.031 (.015)*
Indirect paths via education	SC: Child SEP>education>adult health	.083 (.006)**
	HS: Child SRH>education>adult SEP	.013 (.007)
Social Causation indirect paths via smoking	SC: Child SEP> smoking> adult health	.004 (.002)*
	SC: Child SEP>adult SEP>smoking>adult health	.002 (<.001)**
	SC: Child SEP>education>adult SEP>smoking> adult health	.002 (<.001)**
	Total indirect effect social causation	.091**
	Total indirect effect health selection	.013
	Total social causation effect	.154**
	Total health selection effect	044*
	Model 3.2 including physical activity	
Direct Paths	Social causation direct path	.072 (.017)**
	Health selection direct path	.030 (.013)*
Indirect paths via education	SC: Child SEP>education>adult health	.060 (.006)**
	HS: Child SRH>education>adult SEP	.016 (.008)*
Social Causation indirect paths via physical activity	SC: Child SEP>education>physical activity>adult health	.022 (.003)**
	SC: Child SEP>adult SEP>physical activity>adult health	.003 (.001)*
	SC: Child SEP>education>adult SEP> physical activity >adult health	.004 (.002)*
	Total indirect effect social causation	.089**
	Total indirect effect health selection	.016*
	Total social causation effect	.161**
	Total health selection effect	.046*

**p-value <0.05; ** p-value <0.001*

SC: social Causation

HS: Health Selection

Social causation direct path: diagonal arrow: child SEP→adult health

Health selection direct path: diagonal arrow: child health→adult SEP

Model 1: model including childhood SEP, childhood self-rated health, adult SEP and adult health, oral health or physical function outcome.

Model 2: Model 1 + education included as mediator.

Model 3.1: Model 2 + smoking status.

Model 3.2: Model 2 + physical activity.

These paths are illustrated from Figure 19 to Figure 22.

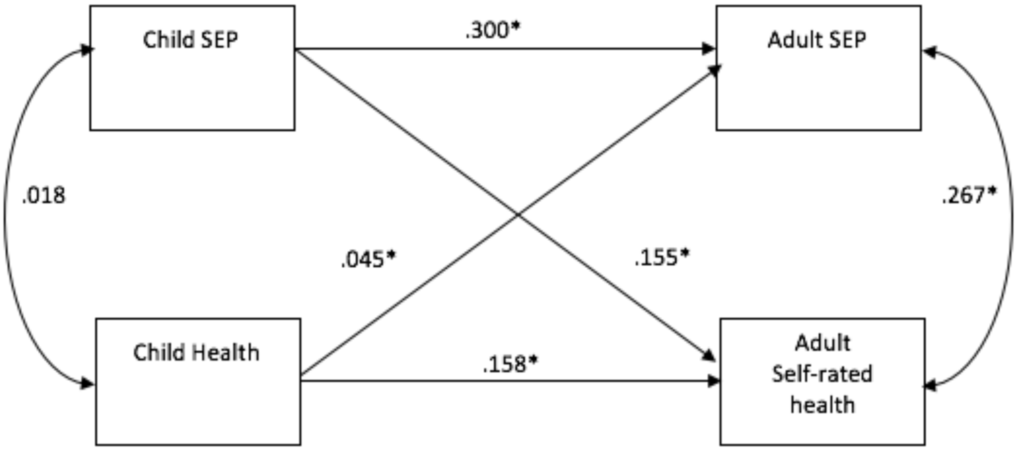


Figure 19. Model 1: SEM standardized regression estimates of the pathways between childhood SEP and health and adult SEP and self-rated general health. Diagonals: social causation direct path (child SEP→adult health) and health selection direct path (child health→adult SEP) (p*<0.05).

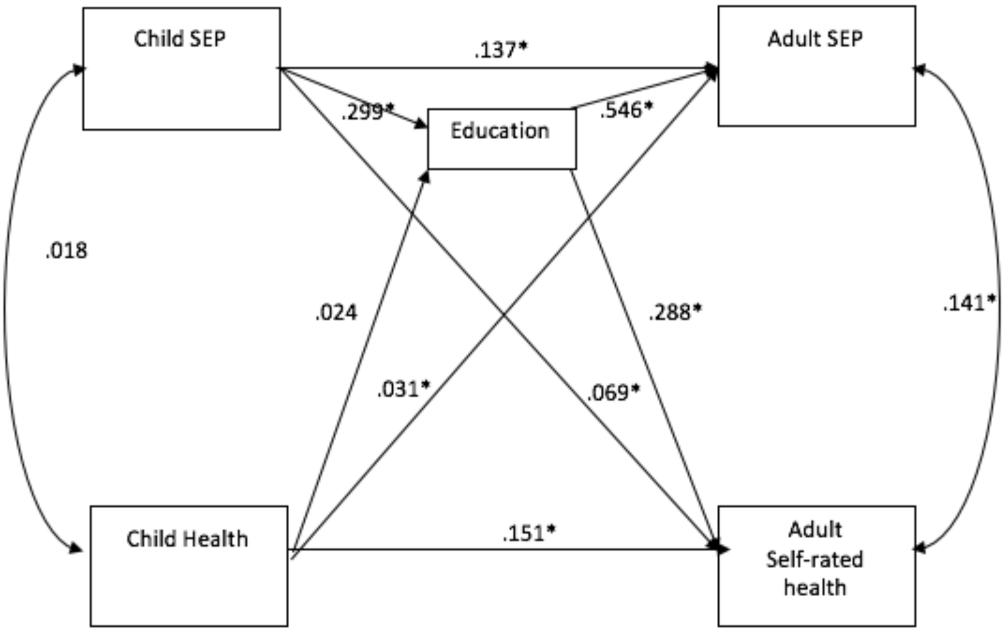


Figure 20. Model 2: SEM standardized regression estimates of the pathways between childhood SEP and health and adult SEP and self-rated general health including education level as mediator (p*<0.05).

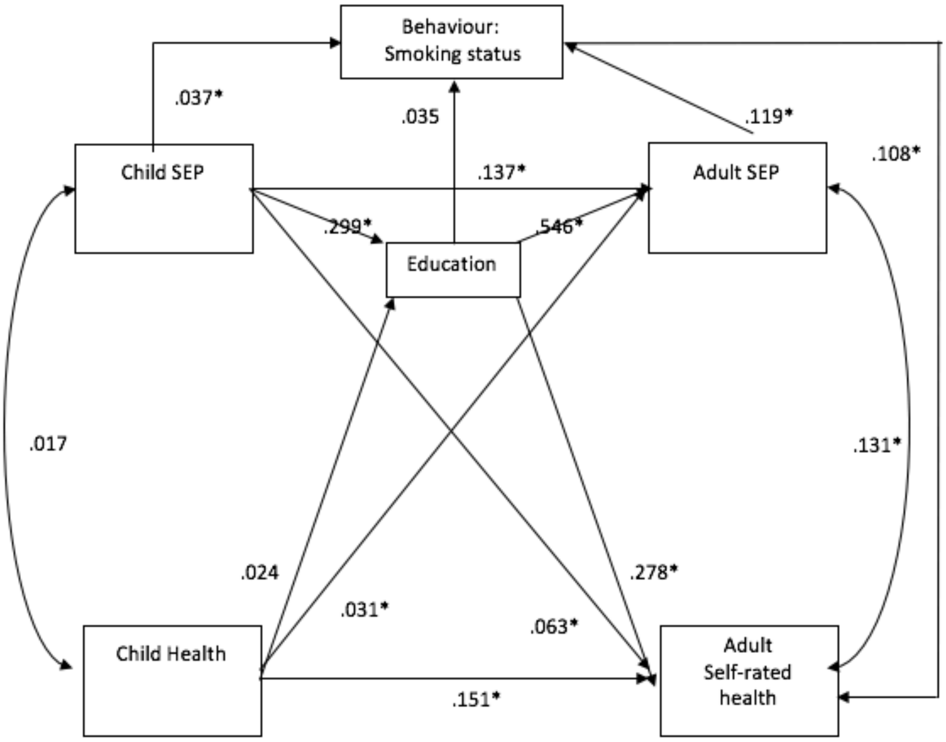


Figure 21. Model 3.1: SEM standardized regression estimates of the pathways between childhood SEP and health and adult SEP and self-rated general health including education level and smoking status as mediator (p*<0.05)

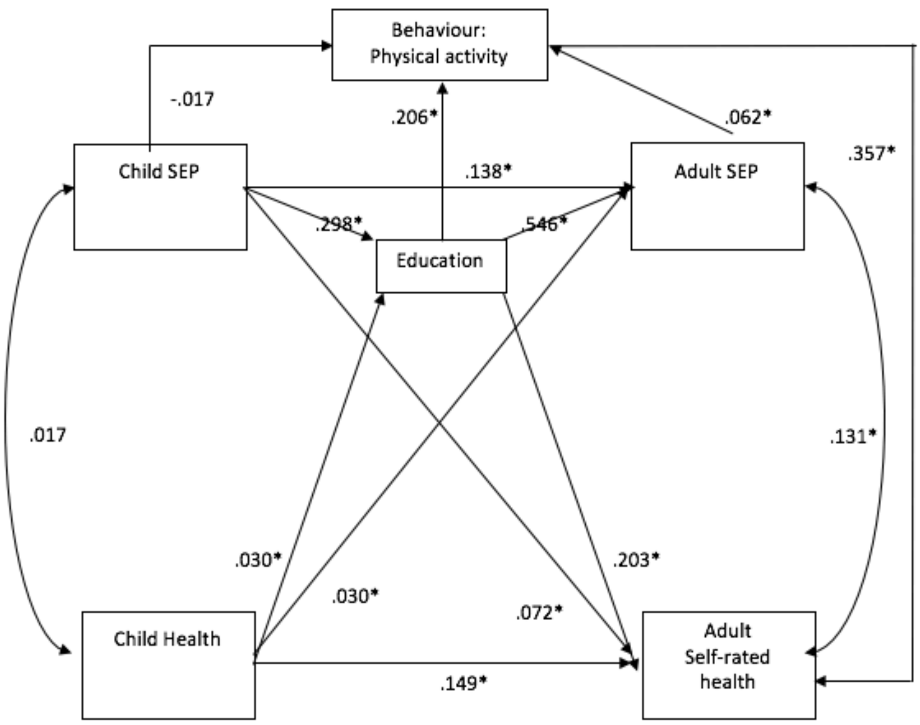


Figure 22. Model 3.2: SEM standardized regression estimates of the pathways between childhood SEP and health and adult SEP and self-rated general health including education level and physical activity as mediator (p*<0.05).

6.2 SEM: Self-rated oral health

The SEM analysis presented on the previous section was repeated using adult self-rated oral health instead of adult self-rated general health.

Table 33 shows the standardized estimates of the models testing the associations between childhood health and SEP and adulthood SEP and poor self-rated oral health.

Figure 23 illustrates Model 1 testing the direct effect of childhood health on adult SEP (health selection) and the direct effect of childhood SEP on self-rated oral health (social causation). There is no statistical evidence that childhood SEP directly affect adult self-rated oral health (regress coef: 0.033, p=0.051). However, there is statistical evidence that poor childhood health is indicative of lower adult SEP (regress coef: 0.045; p-value=0.002).

Figure 24 illustrates Model 2 including education as a mediator. It has been hypothesized that the effect of childhood health and SEP on adult SEP and oral health is through the effect of childhood SEP and health on educational level. The inclusion of education confirmed this hypothesis. After accounting for education, the size of both direct paths - health selection and social causation- decreased. Nevertheless, the direct social causation path remained not significant, showing no statistical evidence of a direct effect of childhood SEP on adult self-rated oral health. Even so, this model suggests an indirect effect of education, showing that lower childhood SEP was associated with lower educational level, which in turn was associated with poor self-rated oral health in older adulthood (regress coef: 0.030, p<0.001). However, the relatively small size of the indirect coefficient provides weak evidence for a potential mediating effect of education on adult self-rated oral health (social causation). Also, there is no statistical evidence of a direct effect of child health on education (regress coef: 0.024, p=0.074). Therefore, there is insufficient statistical evidence of an indirect effect of childhood health on adult SEP through education. These results support a direct effect of childhood health on adult SEP (health selection), and indicate also modest support for an indirect effect of childhood SEP on adult self-rated oral health via education.

Model 3.1 and 3.2 additionally included smoking status and physical activity respectively. These models aimed to test if the effect of childhood SEP on adult self-rated oral health was mediated by behaviours. Both, smoking status and physical activity had a statistical significant direct effect on adult self-rated oral health, less healthy smoking behaviour and no regular physical activity were indicative of poor adult oral health (smoking: regress coef: 0.151, p<0.001; physical activity: regress coef: 0.205, p<0.001).

Figure 25 illustrates Model 3.1 including smoking. The addition of smoking changed the magnitude of the social causation direct and indirect pathways via education. The estimate of the indirect pathway from childhood SEP to adult self-rated oral health via education (child SEP→education→adult oral health) suffered the larger decreased (regress coef: 0.026, p<0.001); implying that the effect that childhood SEP had on adult self-rated oral health was not only mediated by education but also by smoking. This model suggested three social causation (child SEP→adult oral health) indirect paths via smoking. First, lower childhood SEP was indicative of less healthy smoking status, which in turn was indicative of poor self-rated oral health in adulthood (child SEP →smoking→adult oral health). Second, lower childhood SEP was indicative of lower adult SEP, which in turn was indicative of less healthy smoking status, which in turn was indicative of poor self-rated oral health in adulthood (child SEP→ adult SEP→smoking→adult oral health). Third, lower childhood SEP was indicative of lower educational level, which in turn was indicative of lower adult SEP, which in turn was indicative of less healthy smoking status, which in turn was indicative of poor self-rated oral health in adulthood (child SEP→education→adult SEP→smoking→adult oral health). Table 33, presents the standardized estimates of these pathways. All indirect pathways via smoking were statistically significant, supporting the mediating effect of smoking and supporting that childhood SEP relates with adult self-rated oral health through different indirect pathways.

Figure 26 illustrates Model 3.2 including physical activity instead of smoking. Including physical activity caused changes on the magnitude of the social causation direct and indirect pathways. Supporting that physical activity partially mediates the effect of childhood SEP on adult self-rated oral health. This models shows three social causation (child SEP→adult self-rated oral health) indirect pathways via physical activity. First, lower child SEP was indicative of no regular physical activity in adulthood, which in turn was indicative of poor oral health (child SEP →ph. activity→adult oral health). Second, lower childhood SEP was indicative of lower adult SEP, which in turn was indicative of no regular physical activity in adulthood, which in turn was indicative of poor oral health (child SEP→ adult SEP→ph. activity→adult oral health). Finally, lower childhood SEP was indicative of lower educational level, which in turn was indicative of lower adult SEP, which in turn was indicative of no regular physical activity in adulthood, which in turn was indicative of poor oral health (child SEP→education→adult SEP→ph. activity→adult oral health). All the three indirect pathways were statistical significant, supporting the mediation role of physical activity.

Summarizing, these results suggested that childhood SEP had only an indirect effect on adult self-rated oral health (social causation), adopting several pathways via education, smoking and physical activity. While childhood health had a direct effect on adult SEP (health selection).

Lastly, it was also observed that adult SEP and adult health are statistically significantly correlated. Also, child SEP directly affects adult SEP and child health directly affects adult oral health in the expected direction. Although, the effect of childhood SEP on adult SEP was larger than the effect of childhood health on adult oral health. Furthermore, education had a direct effect on adult oral health and SEP in the expected direction. Nevertheless, educational level had a larger effect on adult SEP than on adult oral health.

Table 33. SEM social causation and health selection direct and indirect pathways standardized estimates (S.E) for adult self-rated oral health.

Wave 3 n=8659		
	Model 1	
Direct Paths	Social causation direct path	.033 (.017)
	Health selection direct path	.045 (.014)*
	Model 2	
Direct Paths	Social causation direct path	.003 (.018)
	Health selection direct path	.031 (.013)*
Indirect paths via education	SC: Child SEP>education>adult oral health	.030 (.006)**
	HS: Child SRH>education>adult SEP	.013 (.007)
	Social causation total effect	.033
	Health selection total effect	.046*
	Model 3.1 including smoking	
Direct Paths	Social causation direct path	-.005 (.018)
	Health selection direct path	.031 (.013)*
Indirect paths via education	SC: Child SEP>education> adult oral health	.026 (.006)**
	HS: Child SRH>education>adult SEP	.013 (.007)
Social Causation indirect paths via smoking	SC: Child SEP> smoking> adult oral health	.006 (.002)*
	SC: Child SEP>adult SEP>smoking> adult oral health	.002 (<.001)**
	SC: Child SEP>education>adult SEP>smoking> adult oral health	.003 (.001)**
	Total indirect effect social causation	.037**
	Total indirect effect health selection	.013
	Total social causation effect	.032
	Total health selection effect	.044*
	Model 3.2 including physical activity	
Direct Paths	Social causation direct path	.005 (.019)
	Health selection direct path	.030 (.013)*
Indirect paths via education	SC: Child SEP>education> adult oral health	.015 (.006)*
	HS: Child SRH>education>adult SEP	.016 (.008)*
Social Causation indirect paths via physical activity	SC: Child SEP>education>physical activity> adult oral health	.013 (.002)**
	SC: Child SEP>adult SEP>physical activity> adult oral health	.002 (<.001)*
	SC: Child SEP>education>adult SEP> physical activity > adult oral health	.002 (<.001)*
	Total indirect effect social causation	.032**
	Total indirect effect health selection	.016*
	Total social causation effect	.037
	Total health selection effect	.046*

**p-value <0.05; ** p-value <0.001*

SC: social Causation

HS: Health Selection

Social causation direct path: diagonal arrow: child SEP→adult health

Health selection direct path: diagonal arrow: child health→adult SEP

Model 1: model including childhood SEP, childhood self-rated health, adult SEP and adult health, oral health or physical function outcome.

Model 2: Model 1 + education included as mediator.

Model 3.1: Model 2 + smoking status.

Model 3.2: Model 2 + physical activity.

These paths are illustrated from Figure 23 to Figure 26

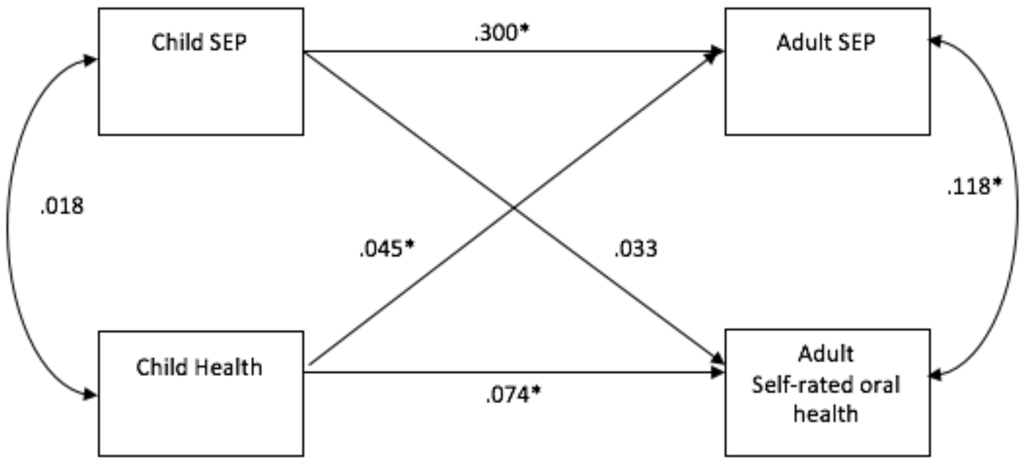


Figure 23. Model 1: SEM standardized regression estimates of the pathways between childhood SEP and health and adult SEP and self-rated oral health. Diagonals: social causation direct path (child SEP→adult health) and health selection direct path (child health→adult SEP) (p*<0.05).

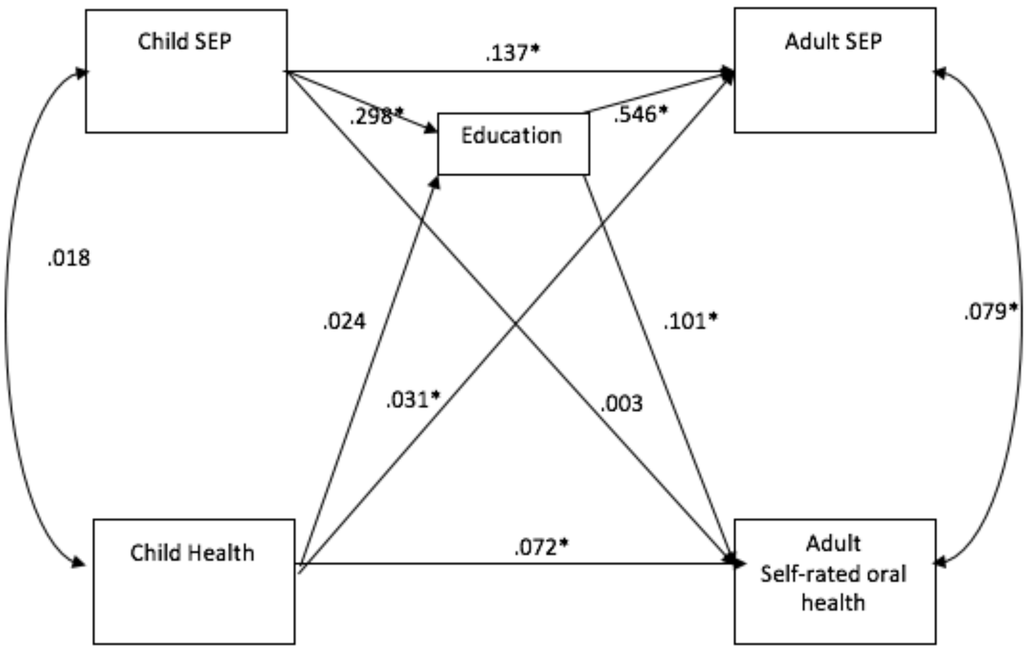


Figure 24. Model 2: SEM standardized regression estimates of the pathways between childhood SEP and health and adult SEP and self-rated oral health including education level as mediator (p*<0.05)

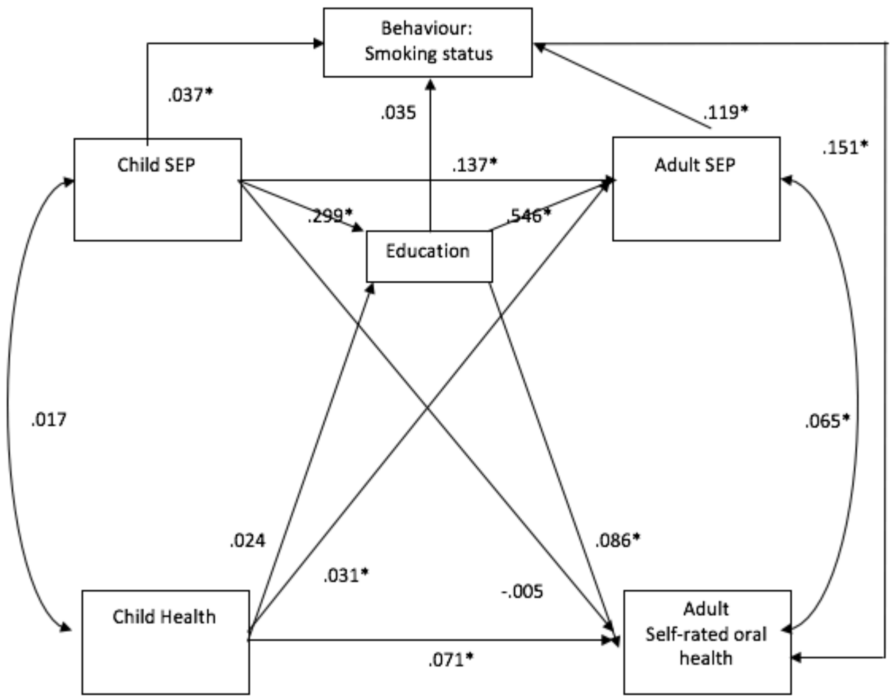


Figure 25. Model 3.1: SEM standardized regression estimates of the pathways between childhood SEP and health and adult SEP and self-rated oral health including education level and smoking status as mediator (p*<0.05).

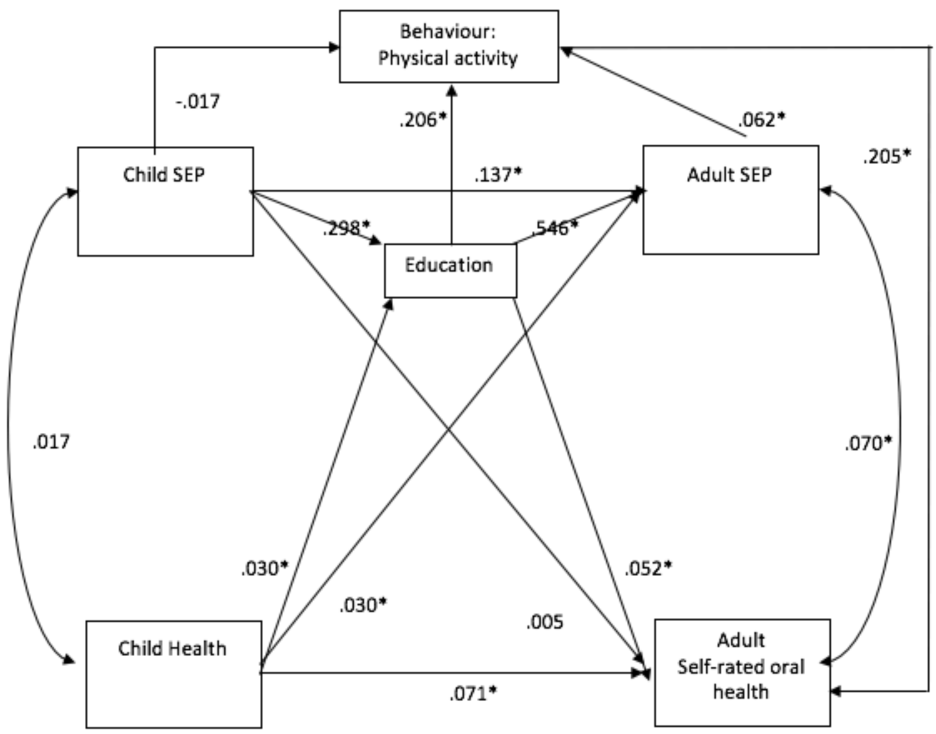


Figure 26. Model 3.2: SEM standardized regression estimates of the pathways between childhood SEP and health and adult SEP and self-rated oral health including education level and physical activity as mediator (p*<0.05).

6.3 SEM: Total tooth loss

The SEM analysis presented on the previous section was repeated but using total tooth loss as the measure of adult health.

Table 34 shows the regression standardized estimates of the social causation and health selection direct and indirect pathways.

Figure 27 shows the cross-lagged paths from childhood circumstances (health and SEP) to adulthood SEP and oral health (total tooth loss). Both, the social causation (child SEP → adult tooth loss) and health selection (child health → adult SEP) direct paths were statistically significant showing a positive association, indicating that lower childhood SEP is indicative of total tooth loss at adulthood (regress coef: 0.197, p<0.001) and that poor childhood health is indicative of lower adult SEP (regress coef: 0.045, p=0.002). Additionally, the estimates suggest that the size of the social causation direct path was larger than the size of the health selection direct path (more than four times) confirming that both pathways, health selection and social causation have a role on the association between SEP and health, but the direct effect of social causation is larger than the direct effect of health selection.

Model 2 includes education as a mediator factor between childhood circumstances and adult SEP and tooth loss (Figure 28). The hypothesis is that the effect of childhood SEP on oral health (tooth loss) and the effect of child health on adult SEP are mediated by education. Therefore, changes in the magnitude of the direct paths estimates would confirm this. When education is included into the model the estimates of both direct pathways – health selection and social causation – decreased (social causation: regress coef: 0.079, p<0.001; health selection: regress coef: 0.031, p=0.012). Implying that education partially mediates the association between child SEP and total tooth loss (social causation) and the association between child health and adult SEP (health selection). This model suggested a strong indirect effect of child SEP on total tooth loss via education (child SEP→education level→adult health) implying that lower SEP is indicative of lower educational level which in turn is indicative of total tooth loss in adulthood (regress coef: 0.117, p<0.001). However, there was no statistical evidence of a direct effect of childhood health on education level (regress coef: 0.013, p=0.074). Therefore, this model supports the thesis that childhood SEP affects total tooth loss directly and indirectly via education in the expected direction (social causation). Also, there is strong statistical evidence supporting that childhood health directly affect adult SEP, but there is modest evidence that poor childhood health is indicative of lower SEP through education (health selection).

Model 3.1 and 3.2 included smoking and physical activity respectively. Both, smoking and physical activity had a strong statistically significant direct effect on total tooth loss (smoking: regress coef: 0.133, p<0.001; physical activity: regress coef: 0.195, p<0.001).

Figure 29 shows the cross-lagged pathways between childhood and adult circumstances including smoking status (Model 3.1). It has been hypothesized that the association between childhood SEP and adult oral health is mediated by smoking. After account by smoking, the estimates of the social causation direct path and indirect pathways decreased. Confirming that smoking partially mediates the association between child SEP and total tooth loss. Even so, a social causation direct effect and indirect effect via education remained.

Additionally, this model suggested that, education level had no statistically significant direct effect on smoking status. Therefore, three social causation indirect paths via smoking were recognized. Firstly, lower child SEP was indicative of less healthy smoking behaviour in adulthood, which in turn was indicative of total tooth loss (child SEP→smoking→total tooth loss). Secondly, lower child SEP was indicative of low adult SEP, which in turn was indicative of a less healthy smoking behaviour, which in turn was indicative of total tooth loss in adulthood (child SEP→adult SEP→smoking→total tooth loss). Thirdly, lower child SEP was indicative of lower educational level, which in turn was indicative of less healthy smoking behaviour, which in turn was indicative of total tooth loss (child SEP→education→adult SEP→smoking→total tooth loss). Table 34 presents the standardized estimates of these three indirect pathways, showing that all paths were statistically significant. Supporting that the effect of child SEP on total tooth loss is trough different direct and indirect pathways via education and or/smoking.

Figure 30 illustrates Model 3.2 including physical activity. The inclusion of physical activity into the model caused changes in the magnitude of the estimates of the direct and indirect social causation pathways. Suggesting a mediation effect of physical activity. The direct path (child SEP→total tooth loss) estimate increased (regress coef: 0.081, p<0.001) and the indirect path via education decreased (regress coef: 0.103, p<0.001). Confirming that the association between child SEP and total tooth loss is mediated by the behaviour physical activity.

Additionally, this model suggested three social causation indirect pathways via physical activity. The first indirect path is through education, lower childhood SEP was indicative of lower educational level, which in turn was indicative of no regular physical activity, which in turn was indicative of total tooth loss (child SEP→education→ph. activity→total tooth loss). The second indirect path is through adult SEP, lower child SEP was indicative of lower adult SEP, which in turn was indicative of no regular physical activity which in turn was indicative of total tooth loss in adulthood (child SEP→adult SEP→ph. activity→total tooth loss). The third indirect path integrates education and adult SEP, lower childhood SEP was indicative of lower educational level, which in turn was indicative lower adult SEP, of which in turn no regular physical activity, which in turn was indicative of total tooth loss (child SEP→education→adult SEP→ph. activity→total tooth loss). Table 34 display the results of these indirect pathways. The estimates of the three indirect pathways were statistically significant, supporting a mediation effect of physical activity.

Summarizing, these models provided statistical evidence that childhood SEP affect total tooth loss prevalence through several pathways, existing an interconnected web between SEP, behaviours and education (social causation). Also, there is strong evidence of a direct effect of childhood health on adult SEP and moderate evidence of an indirect effect through education (health selection).

Additionally, all models showed that SEP at adulthood was statistically significantly correlated with total tooth loss. Adult SEP was indicative of total tooth loss; conversely, total tooth loss was indicative of lower SEP at adulthood. Also, lower childhood SEP was indicative of lower adult SEP and poor childhood health was indicative of poor adult health (total tooth loss). Additionally, the direct paths from education to adult SEP and total tooth loss had the largest estimates within the models. Implying that education directly affects adulthood SEP and total tooth loss in the expected direction. Nevertheless, education had a larger effect on adult SEP than on total tooth loss.

Table 34. SEM social causation and health selection direct and indirect pathways standardized estimates (S.E) for adult total tooth loss.
Wave 3 n=8659

	Model 1	
Direct Paths	Social causation direct path	.197 (.019)**
	Health selection direct path	.045 (.014)*
	Model 2	
Direct Paths	Social causation direct path	.079 (.020)**
	Health selection direct path	.031 (.013)*
Indirect paths via education	SC: Child SEP>education>adult tooth loss	.117 (.007)*
	HS: Child SRH>education>adult SEP	.013 (.007)
	Social causation total effect	.196**
	Health selection total effect	.044*
	Model 3.1 including smoking	
Direct Paths	Social causation direct path	.072 (.020)**
	Health selection direct path	.030 (.015)*
Indirect paths via education	SC: Child SEP>education> adult tooth loss	.113 (.007)**
	HS: Child SRH>education>adult SEP	.013 (.007)
Social Causation indirect paths via smoking	SC: Child SEP> smoking> adult tooth loss	.005 (.002)*
	SC: Child SEP>adult SEP>smoking>adult tooth loss	.002 (<.001)**
	SC: Child SEP>education>adult SEP>smoking>adult tooth loss	.004 (.001)**
	Total indirect effect social causation	.121**
	Total indirect effect health selection	.013
	Total social causation effect	.193**
	Total health selection effect	.043*
	Model 3.2 including physical activity	
Direct Paths	Social causation direct path	.081 (.019)**
	Health selection direct path	.030 (.013)*
Indirect paths via education	SC: Child SEP>education>adult tooth loss	.103 (.007)**
	HS: Child SRH>education>adult SEP	.016 (.008)*
Social Causation indirect paths via physical activity	SC: Child SEP>education>physical activity>adult tooth loss	.012 (.002)**
	SC: Child SEP>adult SEP>physical activity>adult tooth loss	.002 (.001)*
	SC: Child SEP>education>adult SEP> physical activity >adult tooth loss	.002 (.001)*
	Total indirect effect social causation	.119**
	Total indirect effect health selection	.016*
	Total social causation effect	.200**
	Total health selection effect	.046*

**p-value <0.05; ** p-value <0.001*

SC: social Causation

HS: Health Selection

Social causation direct path: diagonal arrow: child SEP→adult health

Health selection direct path: diagonal arrow: child health→adult SEP

Model 1: model including childhood SEP, childhood self-rated health, adult SEP and adult health, oral health or physical function outcome.

Model 2: Model 1 + education included as mediator.

Model 3.1: Model 2 + smoking status.

Model 3.2: Model 2 + physical activity.

These paths are illustrated from Figure 27 to Figure 30

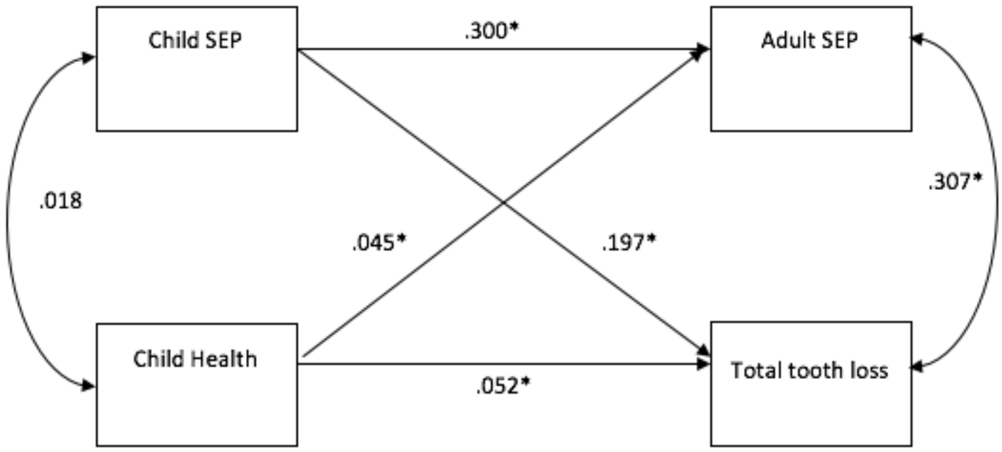


Figure 27. Model 1: SEM standardized regression estimates of the pathways between childhood SEP and health and adult SEP and total tooth loss. Diagonals: social causation direct path (child SEP→adult health) and health selection direct path (child health→adult SEP) (p*<0.05).

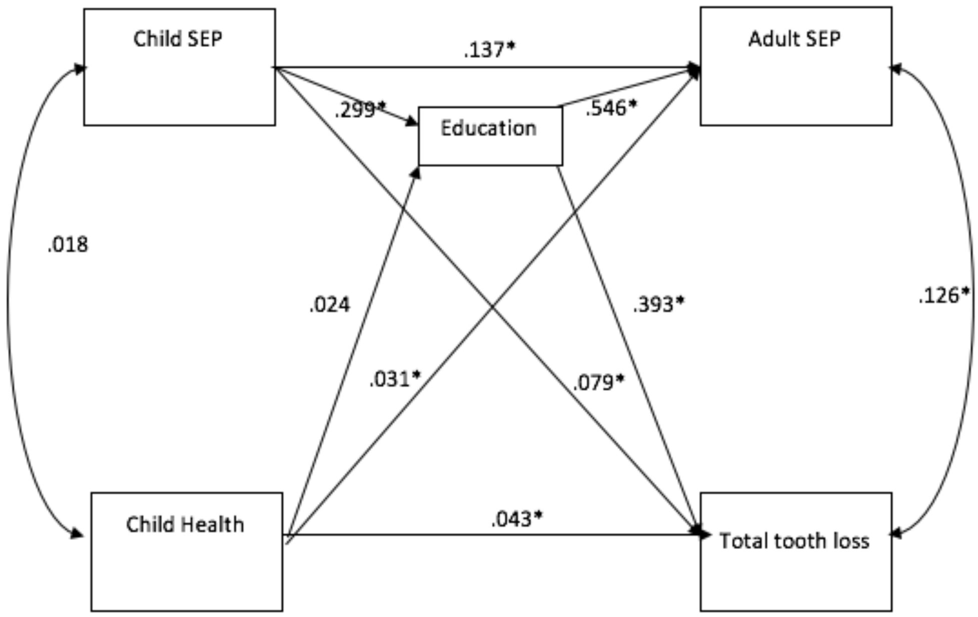


Figure 28. Model 2: SEM standardized regression estimates of the pathways between childhood SEP and health and adult SEP and total tooth loss including education level as mediator (p*<0.05).

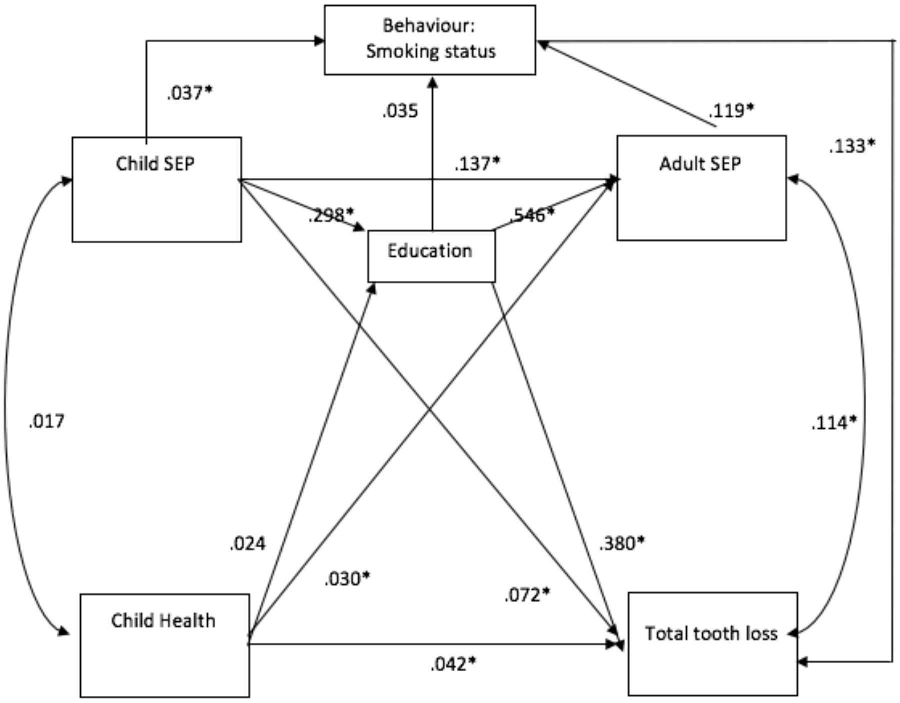


Figure 29. Model 3.1: SEM standardized regression estimates of the pathways between childhood SEP and health and adult SEP and total tooth loss including education level and smoking status as mediator (p*<0.05).

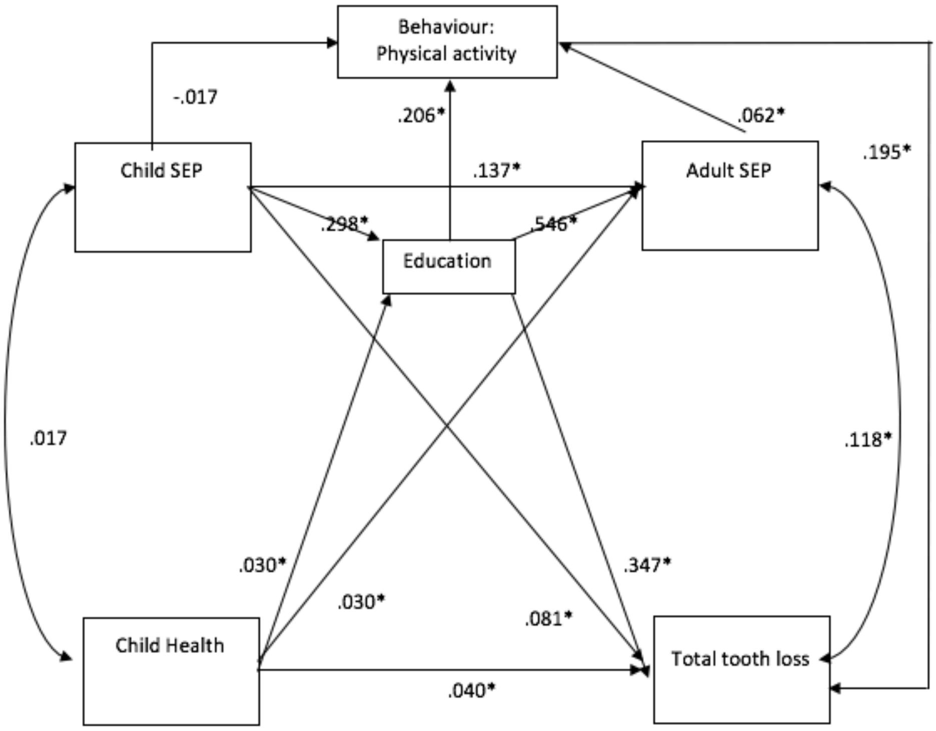


Figure 30. Model 3.2: SEM standardized regression estimates of the pathways between childhood SEP and health and adult SEP and total tooth loss including education level and physical activity as mediator (p*<0.05).

6.4 SEM: Oral impacts on daily performance

The SEM analysis presented on previous sections was repeated using oral impacts on daily performance as the measure of adult health.

Table 35 displays the standardized estimates of the models testing the direct and indirect effect of childhood health and SEP on adulthood SEP and oral impacts on daily performance.

Figure 31 illustrates the cross-lagged panel exploring the social causation and health selection direct paths (Model 1). The social causation direct path (child SEP→adult OIDP) was not statistically significant. There is no statistical evidence of a direct effect of childhood SEP oral impacts on daily performance at adulthood (regress coef: 0.024, p=0.303). Differently, the health selection direct path (child health→adult SEP) was statistically significant, suggesting that poor health was indicative of lower SEP at adulthood (regress coef: 0.045, p-value=0.002).

Figure 32 illustrates Model 2 including education. This model aims to test the hypothesis that childhood health and SEP relate with adult SEP and OIDP through their effect on education. The inclusion of education caused an attenuation of both the social causation and health selection direct paths (social causation: regress coef: 0.003, p=0.913; health selection: regress coef: 0.031, p=0.013), providing some support for a potential mediating role of education. Although no significant direct effect was observed from childhood SEP on adult OIDP, there was statistical evidence that lower childhood SEP was associated with lower educational level (regress coef: 0.298, p<0.001) which in turn was associated with reporting at least one oral impact on daily performance (regress coef: 0.072, p=0.004), thereby suggesting an indirect effect via education. However, the coefficient of the indirect effect was modest (regress coef: 0.021, p<0.001), indicating that, education only partly mediates the effect of childhood SEP on adult OIDP. Additionally, the attenuation of the health selection direct path suggested that education partially explained the effect of childhood health on adult SEP. However, there was no statistical evidence of a direct effect of childhood health on education level (regress coef: 0.024, p=0.074). Therefore, this model supports that childhood health has a direct effect on adult SEP, while childhood SEP has an indirect effect on adult OIDP via education.

Model 3.1 and 3.2 included smoking and physical activity respectively. The hypothesis is that the effect of childhood SEP on oral impacts on daily performance is mediated by smoking and physical activity. Both, smoking and physical activity, had a statistically significant direct effect on OIDP. A less healthy smoking behaviour and no regular physical activity were indicative of at least one oral impact on daily performances (smoking: regress coef: 0.121, p<0.001; physical activity: regress coef: 0.203, p<0.001).

Model 3.1 including smoking status is illustrated in Figure 33. After account by smoking, the magnitude of estimates of the social causation direct path remained similar but the estimates of the indirect path via education decreased (regress coef: 0.018, p=0.018) (child SEP→education→adult OIDP). Moreover, three social causation indirect pathways via smoking were suggested. First, lower childhood SEP was indicative of less healthy smoking status, which in turn was indicative of at least one OIDP (child SEP →smoking→OIDP). Second, lower childhood SEP was indicative of lower adult SEP, which in turn was indicative of less healthy smoking status, which in turn was indicative of at least one OIDP (child SEP→ adult SEP→smoking→adult OIDP). Third, lower childhood SEP was indicative of lower educational level, which in turn was indicative of lower adult SEP, which in turn was indicative of less healthy smoking status, which in turn was indicative of at least one OIDP (child SEP→education→adult SEP→smoking→ adult OIDP). These three indirect paths were statistical significant, supporting that the effect of childhood SEP on adult OIDP is mediated by smoking status.

Model 3.2 including physical activity is illustrated in Figure 34. The inclusion of physical activity caused a decreased of the social causation indirect path via education (child SEP→education→OIDP) (regress coef: 0.007, p=0.391). Supporting that physical activity almost fully mediates the effect of childhood SEP on adult self-rated oral health. Three social causation indirect pathways via physical activity can be recognized. First, lower child SEP was indicative of no regular physical activity in adulthood, which in turn was indicative of at least one OIDP (child SEP →ph. activity→adult OIDP). Second, lower childhood SEP was indicative of lower adult SEP, which in turn was indicative of no regular physical activity in adulthood, which in turn was indicative of reporting at least one OIDP (child SEP→ adult SEP→ph. activity→adult OIDP). Finally, lower childhood SEP was indicative of lower educational level, which in turn was indicative of lower adult SEP, which in turn was indicative of no regular physical activity in adulthood, which in turn was indicative of at least one OIDP (child SEP→education→adult SEP→ph. activity→adult OIDP). All these pathways were statistically significant, confirming that the association between child SEP and OIDP is mediated by the behaviour physical activity.

Summarizing, these models provided statistical evidence of an indirect effect of childhood SEP on adult OIDP via education, smoking status and physical activity (social causation). Additionally, provided statistical evidence of a direct effect of childhood health on adult SEP (health selection).

Lastly, these models show that childhood SEP had a direct effect on adult SEP, and childhood health had a direct effect on adult health in the expected direction. Also, adult SEP and adult OIDP were correlated. Furthermore, education had a direct effect on adult SEP and adult OIDP, excepting in Model 3.2. Generally, the effect of education on SEP was larger than the effect on OIDP.

Table 35. SEM social causation and health selection direct and indirect pathways standardized estimates (S.E) for adult oral impacts on daily performance (OIDP).
Wave 3 n=8659

	Model 1	
Direct Paths	Social causation direct path	.024 (.023)
	Health selection direct path	.045 (.014)*
	Model 2	
Direct Paths	Social causation direct path	.003 (.025)
	Health selection direct path	.031 (.013)*
Indirect paths via education	SC: Child SEP>education>adult OIDP	.021 (.007)*
	HS: Child SRH>education>adult SEP	.013 (.007)
	Social causation total effect	.024
	Health selection total effect	.044*
	Model 3.1 including smoking	
Direct Paths	Social causation direct path	-.004 (.025)
	Health selection direct path	.030 (.013)*
Indirect paths via education	SC: Child SEP>education> adult OIDP	.018 (.008)*
	HS: Child SRH>education>adult SEP	.013 (.007)
Social Causation indirect paths via smoking	SC: Child SEP> smoking> adult OIDP	.005 (.002)*
	SC: Child SEP>adult SEP>smoking> adult OIDP	.002 (<.001)**
	SC: Child SEP>education>adult SEP>smoking> adult OIDP	.002 (<.001)**
	Total indirect effect social causation	.027**
	Total indirect effect health selection	.013
	Total social causation effect	.023**
	Total health selection effect	.043*
	Model 3.2 including physical activity	
Direct Paths	Social causation direct path	.004 (.025)
	Health selection direct path	.030 (.013)*
Indirect paths via education	SC: Child SEP>education> adult OIDP	.007 (.008)
	HS: Child SRH>education>adult SEP	.016 (.008)*
Social Causation indirect paths via physical activity	SC: Child SEP>education>physical activity> adult OIDP	.013 (.003)**
	SC: Child SEP>adult SEP>physical activity> adult OIDP	.002 (.001)*
	SC: Child SEP>education>adult SEP> physical activity > adult OIDP	.002 (.001)*
	Total indirect effect social causation	.023*
	Total indirect effect health selection	.016*
	Total social causation effect	.027**
	Total health selection effect	.046*

**p-value <0.05; ** p-value <0.001*
SC: social Causation
HS: Health Selection
Social causation direct path: diagonal arrow: child SEP→adult health
Health selection direct path: diagonal arrow: child health→adult SEP
Model 1: model including childhood SEP, childhood self-rated health, adult SEP and adult health, oral health or physical function outcome.
Model 2: Model 1 + education included as mediator.
Model 3.1: Model 2 + smoking status.
Model 3.2: Model 2 + physical activity.
These paths are illustrated from Figure 31 to Figure 34

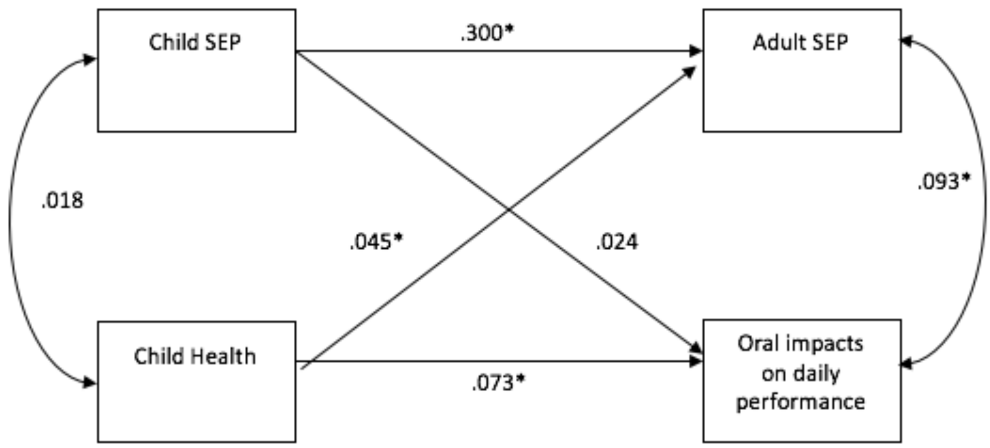


Figure 31. Model 1: SEM standardized regression estimates of the pathways between childhood SEP and health and adult SEP and oral impacts on daily performance. Diagonals: social causation direct path (child SEP→adult health) and health selection direct path (child health→adult SEP) (p*<0.05).

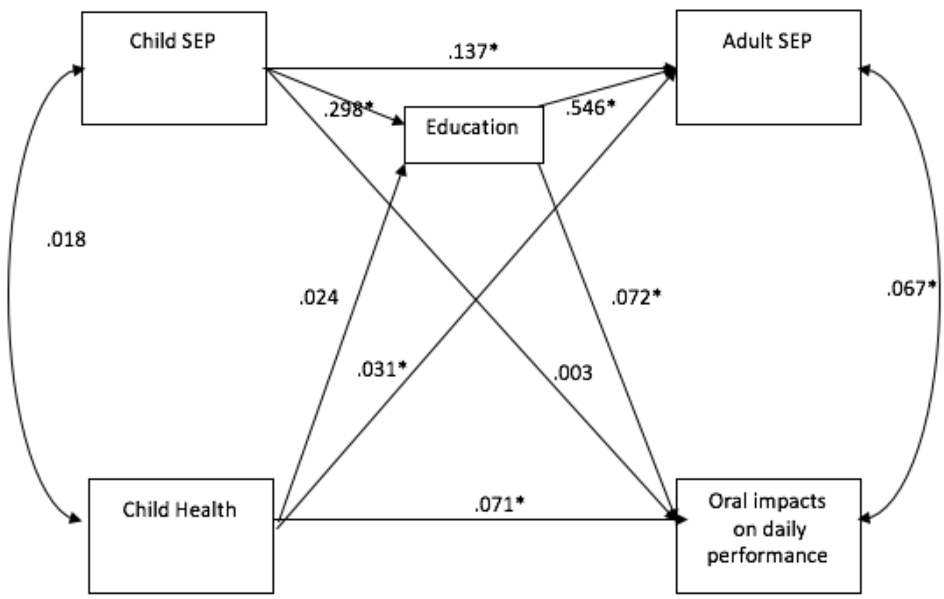


Figure 32. Model 2: SEM standardized regression estimates of the pathways between childhood SEP and health and adult SEP and oral impacts on daily performance including education level as mediator (p*<0.05).

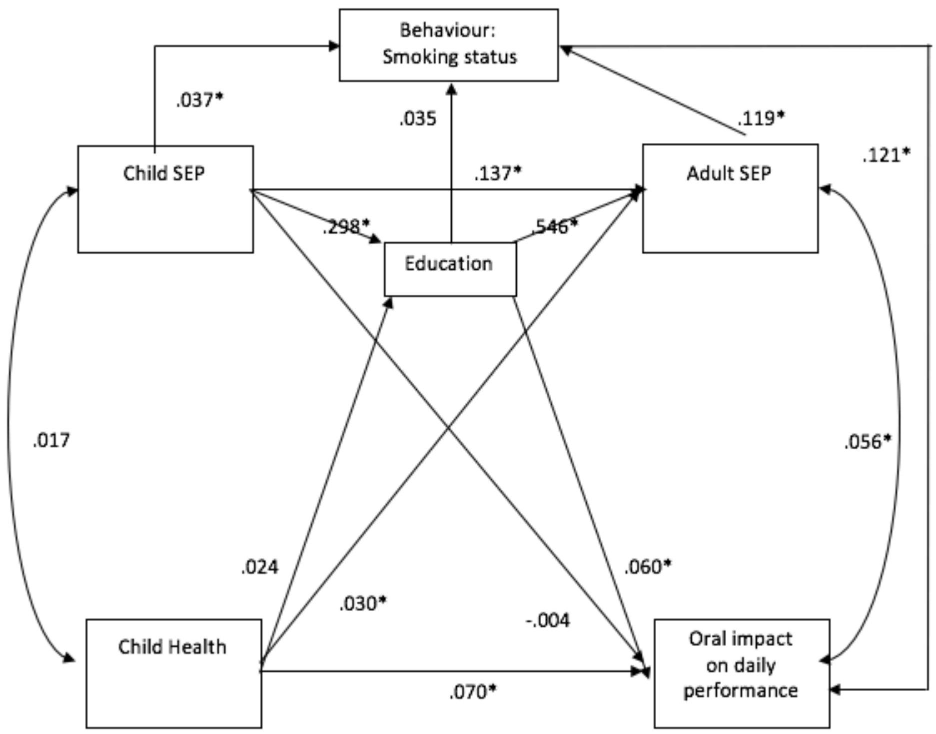


Figure 33. Model 3.1: SEM standardized regression estimates of the pathways between childhood SEP and health and adult SEP and oral impacts on daily performance including education level and smoking status as mediator (p*<0.05)

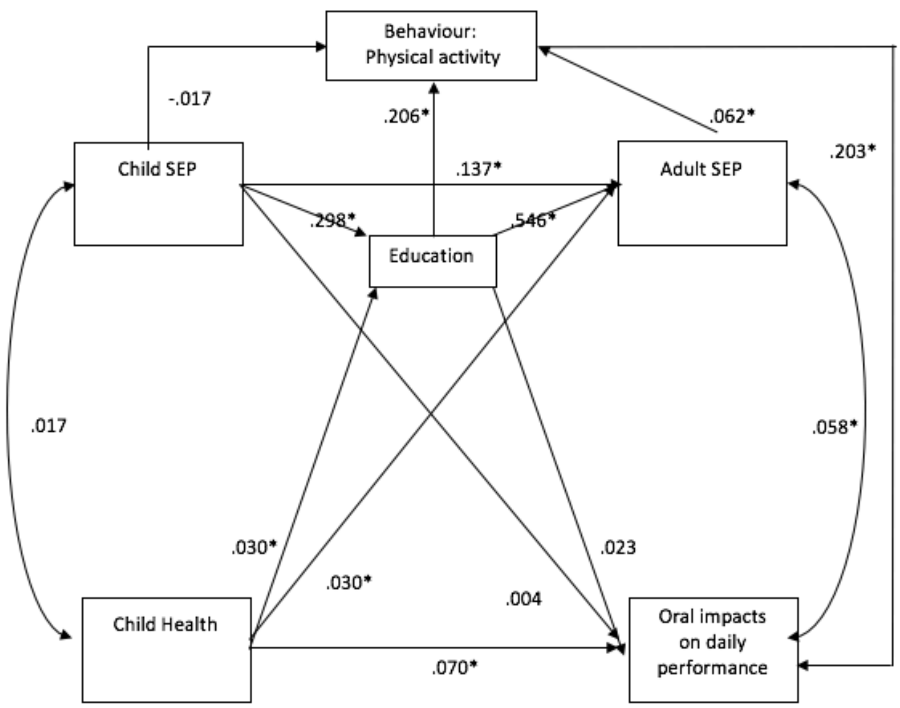


Figure 34. Model 3.2: SEM standardized regression estimates of the pathways between childhood SEP and health and adult SEP and oral impacts on daily performance including education level and physical activity as mediator (p*<0.05).

6.5 SEM: Grip strength

The SEM analysis presented on the previous section was repeated but using grip strength as the measure of physical function in adulthood. The coding in these models is different from the coding for the models using general and oral health outcomes; therefore, the interpretation is different. Grip strength is a continuous outcome measured in kilograms. A higher score is indicative of better physical function. Differently, a higher value of all the other variables within the model was indicative of poorer conditions (lower SEP, lower education, poorer behaviour or poor health).

Table 36 displays the regression standardized estimates of the social causation and health selection direct and indirect pathways.

Model 1 is illustrated on Figure 35. All paths estimates were statistically significant. The path from childhood SEP to adult grip strength (social causation direct path) showed a negative association, implying that lower childhood SEP was indicative of lower grip strength (regress coef: -0.051, p<0.001). The path from childhood health to adult SEP (health selection direct path) showed a positive association, implying that poor childhood health was indicative of lower adult SEP (regress coef: 0.043, p=0.004). Additionally, the social causation path was slightly larger than the health selection direct path.

Model 2 included education (Figure 36). This model tested the hypothesis that education mediates the association between childhood SEP and adult physical function and the association between childhood health and adult SEP. Therefore, a change in the magnitude of the direct paths would confirm the hypothesis. After including education, the estimates of the direct pathways decreased, but remained significant. Confirming that education partially mediates these associations. The inclusion of education also revealed that the social causation (child SEP→grip strength) direct and indirect effect via education had different directions. The direct path suggested a positive association: lower SEP at childhood was indicative of higher grip strength at adulthood (regress coef: 0.049, $p<0.001$). While the association through education was negative, suggesting that lower childhood SEP was indicative of lower educational level, which in turn was indicative of lower grip strength (regress coef: -0.100, $p<0.001$). However, the indirect effect via education was larger than the direct effect. Additionally, this model showed no statistical evidence of a direct effect of childhood health on education. So, even when the inclusion of education decreased the estimate of the health selection direct path (childhood health→adult SEP), there is not enough evidence to concluded an indirect effect of childhood health on adult SEP via education. Nevertheless, the direct effect of childhood health on adult SEP remained significant (health selection).

Model 3.1 and 3.2 included smoking and physical activity respectively. The inclusion of these variables aimed to test the hypothesis that behaviour mediates the associations between childhood SEP with adult physical function.

Figure 37 illustrates Model 3.1 including smoking status. Smoking had a strong statistical significant direct effect on grip strength (regress coef: 0.106, $p<0.001$). Surprisingly, less healthy smoking behaviour was indicative of higher grip strength. The inclusion of smoking into the model caused slight changes of the social causation direct and indirect path via education estimates. Confirming that smoking status partially mediates the association between childhood SEP and adult grip strength.

Also, differently from previous outcomes, education had a statistically significant effect on smoking (regress coef: 0.048, $p<0.007$). Lower education level was indicative of a less healthy smoking behaviour. Therefore, the model suggested four indirect social causation paths via smoking with positive estimates. The first indirect path suggested that lower childhood SEP was indicative of less healthy smoking status, which in turn was indicative of higher grip strength (child SEP→ smoking status→adult grip strength). The second path includes adult SEP suggesting that lower childhood SEP was indicative of lower adult SEP which in turn was indicative of less healthy smoking status which in turn was indicative of higher grip strength (child SEP→adult SEP→smoking status→adult grip strength). The third indirect pathway replace adult SEP for education, suggesting that lower childhood SEP was indicative of lower educational level, which in turn was indicative of less health smoking status, which in turn was indicative of higher grip strength (child SEP→education→smoking status→adult grip strength). The fourth path included adult SEP and education suggesting that childhood SEP was indicative of lower educational level, which in turn was indicative of lower adult SEP, which in turn was indicative of less healthy smoking status which in turn was indicative of higher adult grip strength (child SEP→education→adult SEP→smoking status→adult grip strength). Table 36 present the results of these indirect paths. All indirect social causation paths via smoking were statistically significant, confirming that all mediates the effect of childhood SEP on adult grip strength.

Model 3.2 includes physical function instead of smoking (Figure 38). Physical activity had a strong statistical significant effect on grip strength, no regular physical activity was indicative of lower grip strength (regress coef: -.104, p<0.001). The inclusion of physical activity slightly affected the estimate of the direct and indirect social causation paths. Confirming that the effect of childhood SEP on grip strength is partially mediated by physical function.

Additionally, the model suggested no statistical direct effect of childhood SEP on physical activity, suggesting three social causation indirect paths via physical activity. Firstly, lower SEP was indicative of lower educational level, which in turn was indicative of no regular physical activity in adulthood, which in turn was indicative of low grip strength (child SEP→education→ph. activity→grip strength). Secondly, the path is through adult SEP: lower childhood SEP was indicative of lower adult SEP, which in turn was indicative of no regular physical activity, which in turn was indicative of lower grip strength (child SEP→adult SEP→ph. activity→grip strength). The third path includes education and adult SEP: lower childhood SEP was indicative of lower education, which in turn was indicative of lower adult SEP, which in turn was indicative of no regular physical activity, which in turn was indicative of lower grip strength (child SEP→education→adult SEP→ph. activity→grip strength). The estimates of these indirect paths are presented on Table 36. All these indirect paths were statistically significant; confirming that childhood SEP partially affects grip strength via physical activity.

Summarizing, these results provide statistical evidence of an interconnected web between child SEP, education, smoking, adult SEP and grip strength. Supporting a direct and indirect effect via education and behaviours of childhood SEP on adult grip strength and. Additionally provides evidence of a direct effect of childhood health on adult SEP.

Lastly, all models showed that lower adult SEP was indicative of lower grip strength and vice versa. Furthermore, lower childhood SEP was indicative of lower adult SEP and poor childhood health was indicative of poor adult health. Also, education has a direct effect on adult SEP and grip strength, lower educational level was indicative of lower SEP and lower grip strength. Although, the direct effect of education was larger on adult SEP than on grip strength. Interestingly, from Model 2 there is no statistical evidence of a correlation between adult SEP and grip strength.

Table 36. SEM social causation and health selection direct and indirect pathways standardized estimates (S.E) for grip strength.

Wave 3 n=8659

	Model 1	
Direct Paths	Social causation direct path	-.051 (.012)**
	Health selection direct path	.043 (.015)*
	Model 2	
Direct Paths	Social causation direct path	.049 (.013)**
	Health selection direct path	.035 (.013)*
Indirect paths via education	SC: Child SEP>education>adult grip strength	-.100 (.005)**
	HS: Child SRH>education>adult SEP	.007 (.008)
	Social causation total effect	-.051**
	Health selection total effect	0.42*
	Model 3.1 including smoking	
Direct Paths	Social causation direct path	.042 (.013)*
	Health selection direct path	.034 (.013)*
Indirect paths via education	SC: Child SEP>education> adult grip strength	-.104 (.005)**
	HS: Child SRH>education>adult SEP	.007 (.008)
Social Causation indirect paths via smoking	SC: Child SEP> smoking> adult grip strength	.006 (.002)**
	SC: Child SEP>adult SEP>smoking>adult grip strength	.002 (.001)**
	SC: Child SEP>education> smoking> adult grip strength	.002 (.001)*
	SC: Child SEP>education>adult SEP>smoking> adult grip strength	.002 (<.001)**
	Total indirect effect social causation	-.092**
	Total indirect effect health selection	.007
	Total social causation effect	-.050**
	Total health selection effect	.041*
	Model 3.2 including physical activity	
Direct Paths	Social causation direct path	.052 (.013)**
	Health selection direct path	.035 (.013)*
Indirect paths via education	SC: Child SEP>education>adult grip strength	-.094 (.005)**
	HS: Child SRH>education>adult SEP	.008 (.008)
Social Causation indirect paths via physical activity	SC: Child SEP>education>physical activity>adult grip strength	-.006 (.001)**
	SC: Child SEP>adult SEP>physical activity>adult grip strength	-.001 (<.001)*
	SC: Child SEP>education>adult SEP> physical activity >adult grip str	-.001 (<.001)*
	Total indirect effect social causation	-.101**
	Total indirect effect health selection	.009
	Total social causation effect	-.049**
	Total health selection effect	.044*

**p-value <0.05; ** p-value <0.001*

SC: social Causation

HS: Health Selection

Social causation direct path: diagonal arrow: child SEP→adult health

Health selection direct path: diagonal arrow: child health→adult SEP

Model 1: model including childhood SEP, childhood self-rated health, adult SEP and adult health, oral health or physical function outcome.

Model 2: Model 1 + education included as mediator.

Model 3.1: Model 2 + smoking status.

Model 3.2: Model 2 + physical activity.

These paths are illustrated from Figure 35 to Figure 38

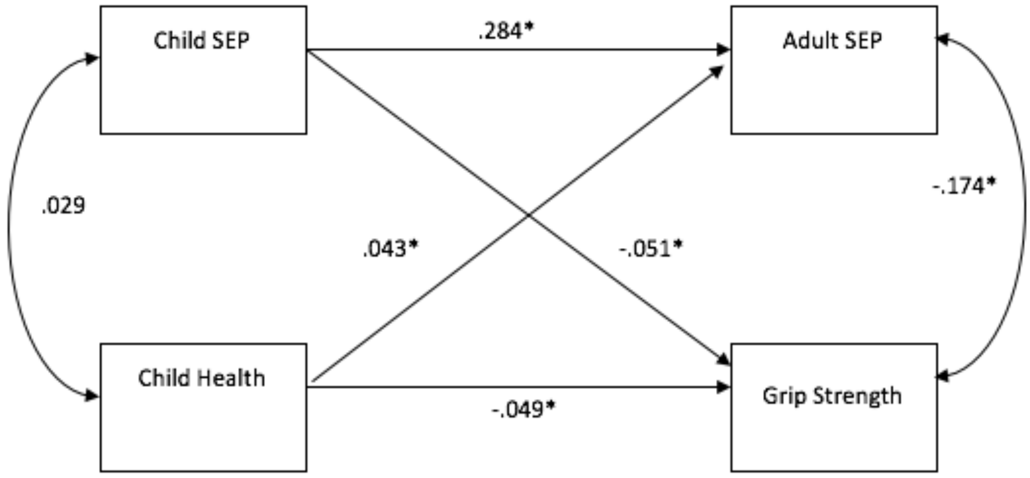


Figure 35. Model 1: SEM standardized regression estimates of the pathways between childhood SEP and health and adult SEP and grip strength. Diagonals: social causation direct path (child SEP→adult health) and health selection direct path (child health→adult SEP) (p*<0.05).

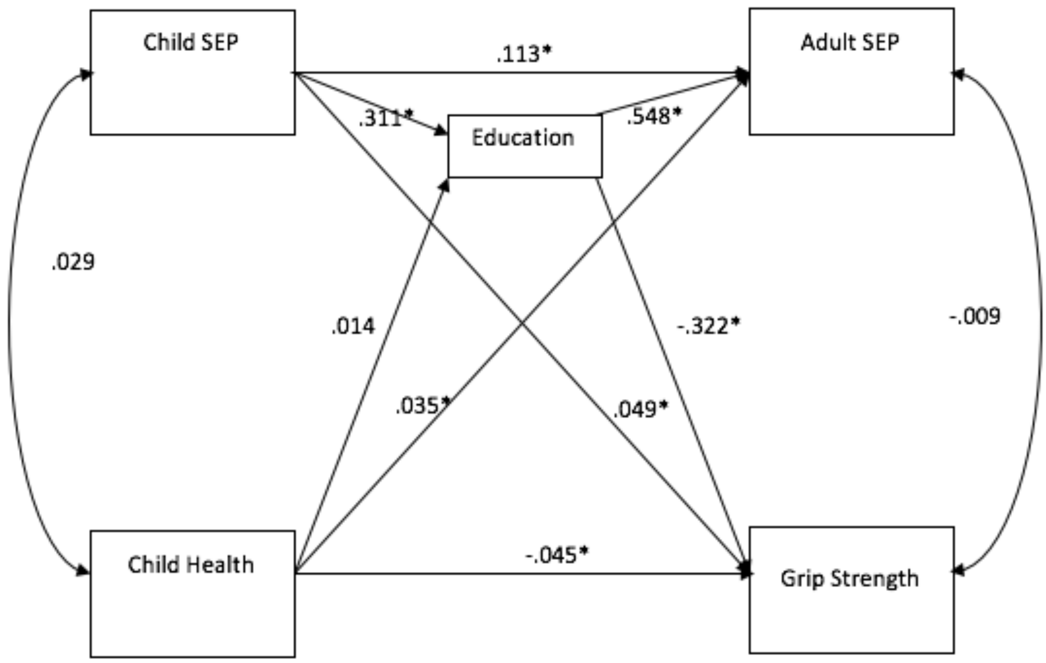


Figure 36. Model 2: SEM standardized regression estimates of the pathways between childhood SEP and health and adult SEP and grip strength including education level as mediator (p*<0.05).

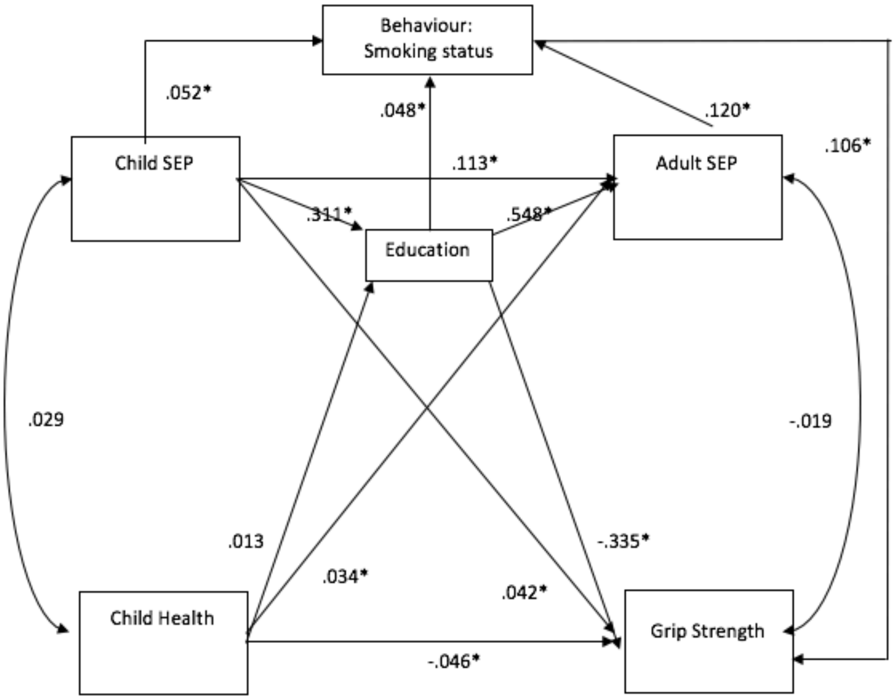


Figure 37. Model 3.1: SEM standardized regression estimates of the pathways between childhood SEP and health and adult SEP and grip strength including education level and smoking status as mediator (p*<0.05).

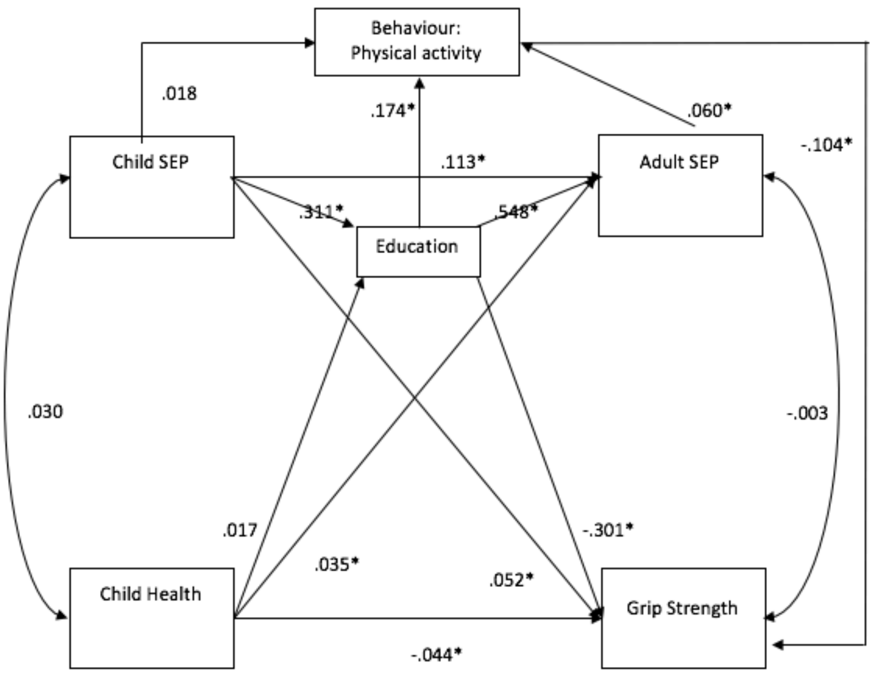


Figure 38. Model 3.2: SEM standardized regression estimates of the pathways between childhood SEP and health and adult SEP and grip strength including education level and physical activity as mediator (p*<0.05).

6.5.1 SEM: grip strength stratified by gender

The SEM analysis, presented on the previous section, was tested separately in men and women. Only grip strength was stratified based on the results of the regression analyses (Chapter 5). Grip strength was the only outcome that showed considerably different associations with social mobility among gender. All the other general and oral health outcomes suggested slight or no differences between men and women.

SEM stratification analyses showed slight differences between men and women (Table 37). In model 1, the social causation direct path from childhood SEP to adult grip strength was statistically significant among both, men and women (Figure 39). Suggesting that childhood SEP directly affect adult grip strength in both gender. Lower adult SEP was indicative of lower grip strength in men and women. However, the health selection direct path from childhood health to adult SEP was statistically significant only among women. Nevertheless, the size of the health selection direct path estimates was very similar in men and women suggesting a positive association. Poor childhood health was indicative of lower adult SEP.

Model 2 included education (Figure 40). After adding education, the social causation direct path (child SEP→adult grip strength) was not significant anymore and the estimates were dramatically attenuated among men and women. Suggesting that education almost completely mediates the effect of childhood SEP on adult grip strength. For both, men and women, lower SEP at childhood was indicative of lower education level, which in turn was indicative of lower grip strength measurements at adulthood. The health selection direct path estimate decreased after included education. However, no statistical evidence was found to confirmed an indirect effect via education of childhood health on adult SEP in any of the gender. Additionally, is interesting to observed that the direct effect of childhood

SEP on adult SEP is considerably larger on men than women (men: regress coef: 0.143, p<0.001; women: regress coef: 0.087, p<0.001).

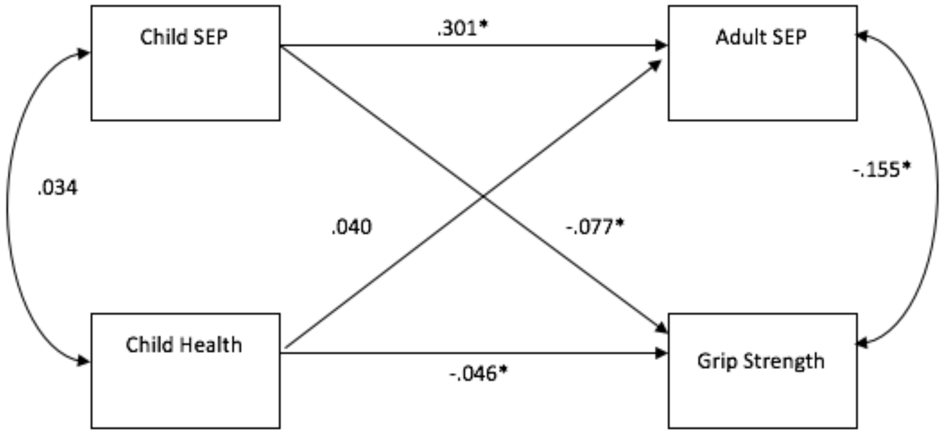
Model 3.1 (including smoking status) (Figure 41) and Model 3.2 (including physical activity) (Figure 42) showed similar results among men and women, suggesting that the direction of the effect was the same among men and women. Lower childhood SEP was statistically significantly associated with adult gip strength, and the effect was almost fully mediated by education and behaviours (smoking status or physical activity). Lower childhood SEP was indicative of lower educational level, which in turn was indicative of lower grip strength measurements. Also, lower childhood SEP was indicative of less healthy smoking status which in turn was indicative of better grip strength among both gender. Lastly, lower childhood SEP was indicative of no regular physical activity, which in turn was indicative of lower grip strength measurements.

Table 37. SEM social causation and health selection direct and indirect pathways standardized estimates (S.E) for grip strength stratified by gender.
Outcome: Grip strength. Wave 4 n=9805

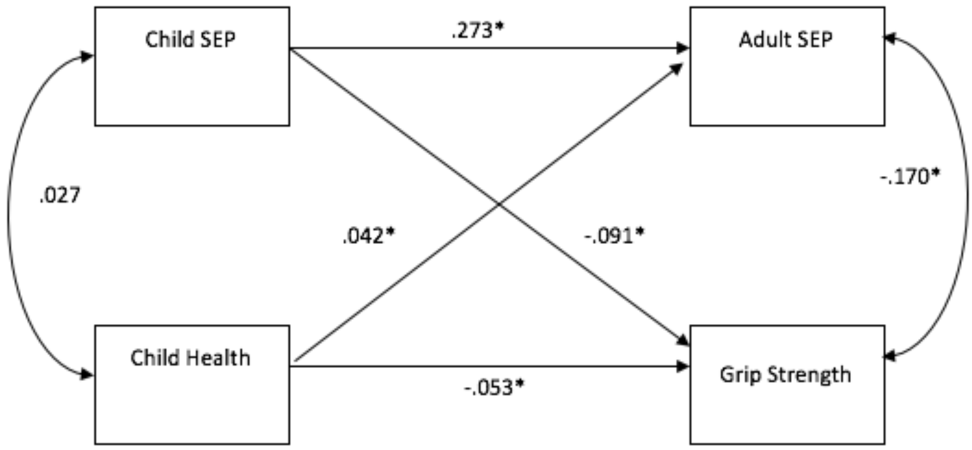
	Men n=4398	Women n=5407
Model 1		
Social causation direct path (x)	-.077 (.018)**	-.091 (.017)**
Health selection direct path (y)	.040 (.023)	.042 (.019)*
Model 2		
Social causation direct path (x)	.003 (.019)	-.006 (.019)
Health selection direct path (y)	.036 (.018)	.035 (.016)*
Social causation indirect path via education (a)	-.079 (.007)**	-.085 (.007)**
Health selection indirect path via education (b)	.004 (.011)	.007 (.010)
Total social causation effect	-.076**	-.091**
Total health selection effect	.040	.042
Model 3.1 including smoking		
Social causation direct path	.003 (.019)	-.009 (.019)
Health selection direct path	.035 (.021)	.033 (.016)*
SC: Child SEP>education> adult grip strength	-.079 (.007)**	-.088 (.007)**
HS: Child SRH>education>adult SEP	.003 (.011)	.006 (.010)
SC: Child SEP> smoking> adult grip strength	.000 (.001)	.003 (.001)
SC: Child SEP>adult SEP>smoking>adult grip strength	.000 (<.001)	.001 (<.001)*
SC: Child SEP>education> smoking> adult grip strength	.000 (.001)	.001 (.001)
SC: Child SEP>education>adult SEP>smoking>adult grip strength	.000 (<.001)	.001 (<.001)*
Total indirect effect social causation	-.079	-.082
Total indirect effect health selection	.003	.006
Total social causation effect	-.076**	.091**
Total health selection effect	.039	.039
Model 3.2 including physical activity		
Social causation direct path	.008 (.019)	-.005 (.020)
Health selection direct path	.036 (.021)	.032 (.016)
SC: Child SEP>education>adult grip strength	-.064 (.007)**	-.060 (.007)**
HS: Child SRH>education>adult SEP	.006 (.011)	.010 (.010)
SC: Child SEP>education>physical activity>adult grip strength	-.012 (.003)**	-.024 (.004)**
SC: Child SEP>adult SEP>physical activity>adult grip strength	-.003 (.001)*	-.001 (.002)
SC: Child SEP>education>adult SEP> ph activity >adult grip strength	-.003 (.001)*	.000 (.001)
Total indirect effect social causation	-.082**	-.085**
Total indirect effect health selection	.006	.010
Total social causation effect	-.074**	-.090
Total health selection effect	.042	.042

**p-value <0.05; ** p-value <0.001*

SC: social Causation; HS: Health Selection; Social causation direct path: diagonal arrow: child SEP→adult health; Health selection direct path: diagonal arrow: child health→adult SEP; Model 1: model including childhood SEP, childhood self-rated health, adult SEP and adult grip strength. Model 2: Model 1 + education included as mediator. Model 3.1: Model 2 + smoking status. Model 3.2: Model 2 + physical activity. These paths are illustrated from Figure 39 to Figure 42.



Men



Women

Figure 39. Model 1: Men and women SEM standardized regression estimates of the pathways between childhood SEP and health and adult SEP and grip strength. Diagonals: social causation direct path (child SEP→adult health) and health selection direct path (child health→adult SEP) (p*<0.05)

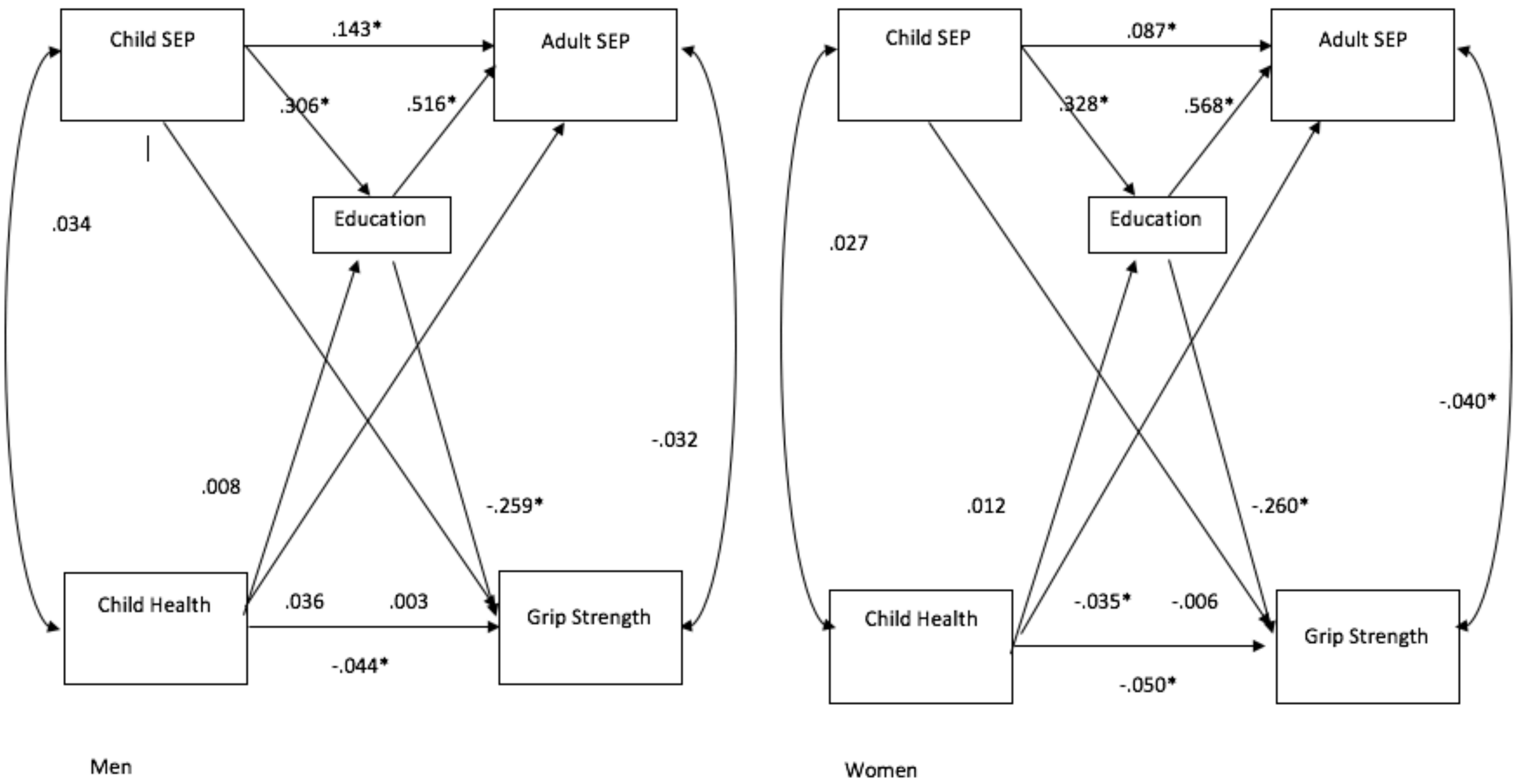


Figure 40. Model 2: Men and women SEM standardized regression estimates of the pathways between childhood SEP and health and adult SEP and grip strength including education level as mediator (p*<0.05).

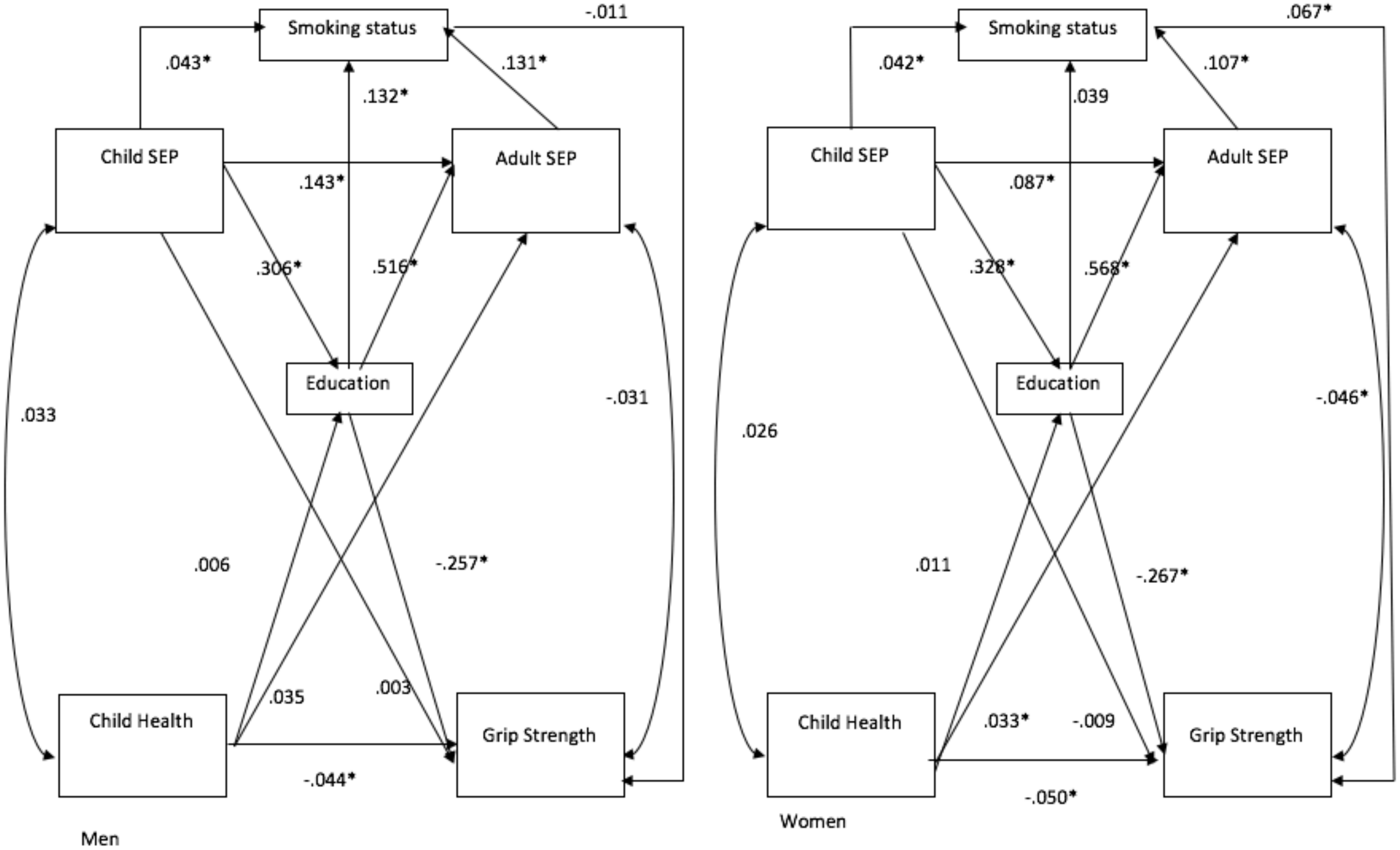


Figure 41. Model 3.1: Men and women SEM standardized regression estimates of the pathways between childhood SEP and health and adult SEP and grip strength including education level and smoking status as mediator (p*<0.05).

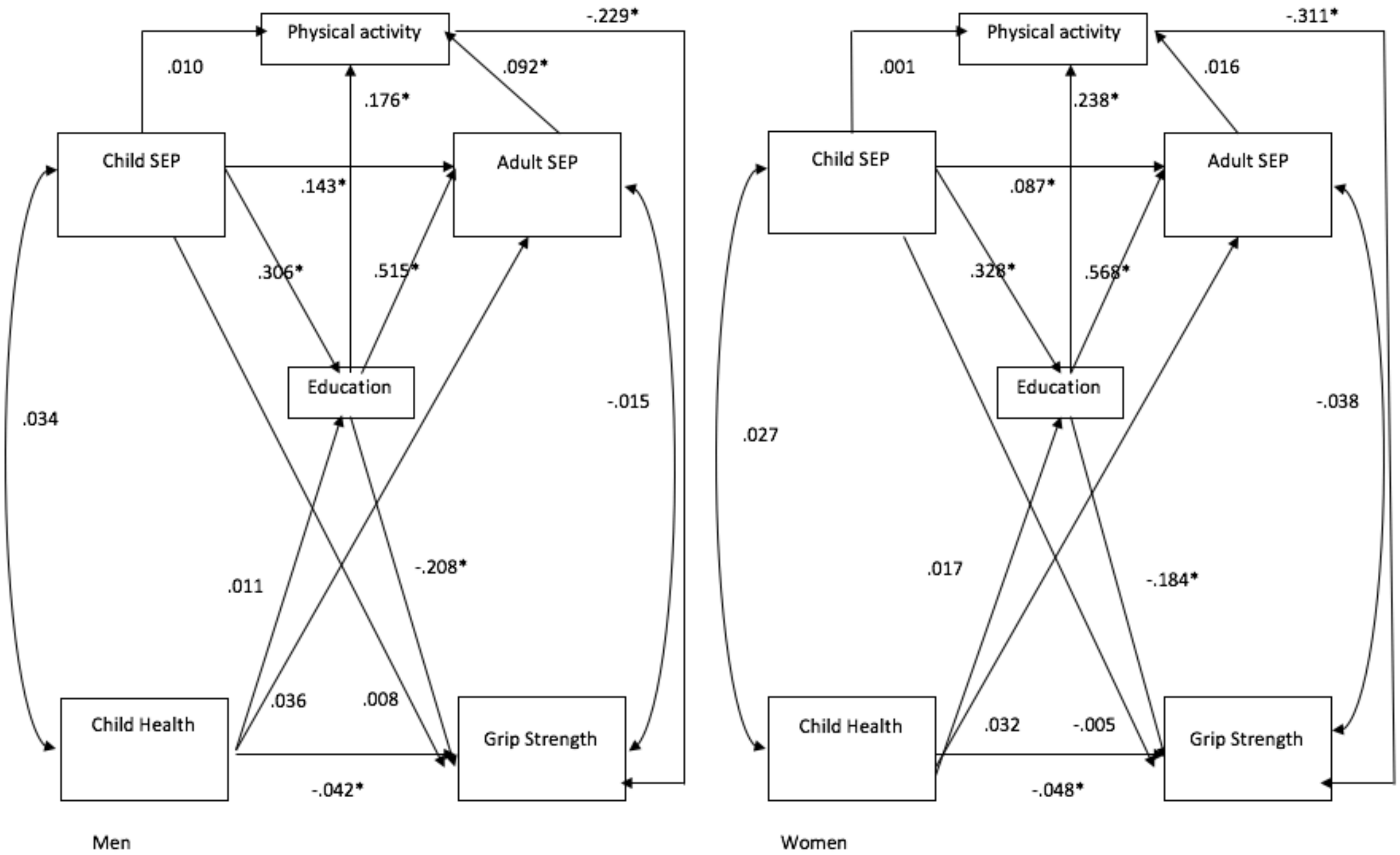


Figure 42. Model 3.2: Men and women SEM standardized regression estimates of the pathways between childhood SEP and health and adult SEP and grip strength including education level and physical activity as mediator (p*<0.05)

6.6 Structural equation modelling: summary of main findings

Table 38 shows the standardized estimates of the social causation and health selection direct and indirect path via education and behaviours of all five outcomes. The same SEM analysis was conducted changing only the adult health and physical function outcome. The aim of these analyses was to test the effect of childhood SEP on adult health and function, known as social causation, and test the effect of childhood health on adult SEP, known as health selection. In addition, it aimed to test the hypothesis that these pathways were mediated by education and health-related behaviours, specifically smoking and physical activity.

Regarding the social causation theory (childhood SEP affects adult general health oral health and physical function) it was found a statistically significant direct effect of childhood SEP on adult poor general health, total tooth loss and grip strength. Generally, lower childhood SEP was indicative of poor self-rated general health, total tooth loss and lower grip strength. This effect remained statistically significant even after account for mediators (education and behaviours). However, there was no statistical evidence of a direct effect of childhood SEP on adult self-rated oral health and oral impacts on daily performance.

Education and behaviours were identified as mediators of the effect of childhood SEP on adult general health, oral health and physical function. The inclusion of education into the models (Model 2) attenuated the social causation direct paths estimates (child SEP→adult health) for all five outcomes. However, there was still no statistical evidence of a direct effect of childhood SEP on adult self-rated oral health and oral impacts on daily performances. Even so, the social causation indirect effect via education was statistically significant in all models (child SEP→education→adult health). Lower childhood SEP was indicative of lower educational level, which in turn was indicative of poor self-rated general health, poor self-rated oral health, total tooth loss, at least one oral impact on daily performance and lower grip strength. Confirming the hypothesis that education mediates the effect of childhood SEP on adult health and physical function. The inclusion of smoking status and physical activity (separately on model 3.1 and 3.2) generally attenuated the estimates of the social causation direct and indirect paths via education. Moreover, the social causation indirect paths via behaviours were statistically significant in all models. Several pathways through education and/or behaviours were identified. Generally, lower childhood SEP was indicative of less healthy behaviours, which in turn were indicative of poor general and oral health, total tooth loss oral impacts on daily performance and lower grip strength. Confirming the hypothesis that smoking and physical activity mediates the effect of childhood SEP on health and function. However, the standardized path coefficients for the indirect effect of childhood SEP on adult health via behaviours generally indicated a relatively small effect size, supporting the hypothesis that the effect of childhood SEP on the outcomes (adult general health, oral health and physical function) is modestly mediated by health-related behaviours (Table 38).

Regarding the health selection theory (childhood health affects adult SEP) it was found a statistically significant direct effect of childhood health on adult SEP in all models, even after account for education. Poor childhood health was indicative of lower adult SEP.

The inclusion of education into the models caused an attenuation of the health selection direct path estimates, providing some evidence of a mediation effect of education. However, there was no statistical evidence confirming that childhood health directly affects education, excepting on model 3.2. Providing only moderate evidence to affirm that the mechanism through which childhood health affect adult SEP is via education.

Summarizing, these results provided evidence for both social mobility theories. Suggesting a direct and indirect effect of childhood SEP on adult general health, oral health and physical function. Supporting the social causation theory. In addition, these results suggested a direct effect of childhood health on adult SEP and moderate evidence of an indirect effect via education. Supporting the health selection theory.

Lastly, these results also showed that the size of the social causation direct path was generally larger that the size of the health selection direct path for self-rated general health, tooth loss and grip strength. Moreover, the social causation total effect for these three outcomes was larger than the health selection total effect (Table 32 to Table 37). Supporting that both social mobility theories co-exist, but for those outcomes that social causation direct effect was evidenced, the direct effect of childhood SEP on adult health was larger than the direct effect of childhood health on adult SEP.

Table 38. SEM social causation and health selection direct and indirect standardized estimates (S.E) for adult general health, oral health and physical function outcomes.

		Wave 3 n=8659				Wave 4 n=9805
		Self-rated health	Self-rated oral health	Tooth loss	Oral impacts	Grip Strength
	Model 1					
Direct Paths	Social causation direct path	.155 (.015)**	.033 (.017)	.197 (.019)**	.024 (.023)	-.051 (.012)**
	Health selection direct path	.045 (.014)*	.045 (.014)*	.045 (.014)*	.045 (.014)*	.043 (.015)*
	Model 2					
Direct Paths	Social causation direct path	.069 (.016)**	.003 (.018)	.079 (.020)**	.003 (.025)	.049 (.013)**
	Health selection direct path	.031 (.013)*	.031 (.013)*	.031 (.013)*	.031 (.013)*	.035 (.013)*
Indirect paths via	SC: Child SEP>education>adult health/function	.086 (.006)**	.030 (.006)**	.117 (.007)*	.021 (.007)*	-.100 (.005)**
education	HS: Child SRH>education>adult SEP	.013 (.007)	.013 (.007)	.013 (.007)	.013 (.007)	.007 (.008)
	Model 3.1 including smoking					
Direct Paths	Social causation direct path	.063 (.016)**	-.005 (.018)	.072 (.020)**	-.004 (.025)	.042 (.013)*
	Health selection direct path	.031 (.015)*	.031 (.013)*	.030 (.015)*	.030 (.013)*	.034 (.013)*
Indirect paths via	SC: Child SEP>education> adult health/function	.083 (.006)**	.026 (.006)**	.113 (.007)**	.018 (.008)*	-.104 (.005)**
education	HS: Child SRH>education>adult SEP	.013 (.007)	.013 (.007)	.013 (.007)	.013 (.007)	.007 (.008)
Social Causation	SC: Child SEP> smoking> adult health/function	.004 (.002)*	.006 (.002)*	.005 (.002)*	.005 (.002)*	.006 (.002)**
indirect paths via	SC: Child SEP>adult SEP>smoking> adult health/function	.002 (.001)**	.002 (.001)**	.002 (.001)**	.002 (.001)**	.002 (.001)**
smoking	SC: Child SEP>educat>adult SEP>smoking> adult health/funct	.063 (.016)**	.003 (.001)**	.004 (.001)**	.002 (.001)**	.002 (.001)*
	Model 3.2 including physical activity					
Direct Paths	Social causation direct path	.072 (.017)**	.005 (.019)	.081 (.019)**	.004 (.025)	.052 (.013)**
	Health selection direct path	.030 (.013)*	.030 (.013)*	.030 (.013)*	.030 (.013)*	.035 (.013)*
Indirect paths via	SC: Child SEP>education> adult health/function	.060 (.006)**	.015 (.006)*	.103 (.007)**	.007 (.008)	-.094 (.005)**
education	HS: Child SRH>education>adult SEP	.016 (.008)*	.016 (.008)*	.016 (.008)*	.016 (.008)*	.008 (.008)
Social Causation	SC: Child SEP>education>physical activity> adult health/funct	.022 (.003)**	.013 (.002)**	.012 (.002)**	.013 (.003)**	-.006 (.001)**
indirect paths via	SC: Child SEP>adult SEP>physical activity> adult oral health	.003 (.001)*	.002 (.001)*	.002 (.001)*	.002 (.001)*	-.001 (.000)*
physical activity	SC: Child SEP>educ>adult SEP> physical activity > health/funct	.004 (.002)*	.002 (.001)*	.002 (.001)*	.002 (.001)*	-.001 (.000)*

**p-value <0.05; ** p-value <0.001*

SC: social Causation; HS: Health Selection; Social causation direct path: diagonal arrow: child SEP→adult health; Health selection direct path: diagonal arrow: child health→adult SEP

Model 1: model including childhood SEP, childhood self-rated health, adult SEP and adult health, oral health or physical function outcome. Model 2: Model 1 + education included as mediator. Model 3.1: Model 2 + smoking status. Model 3.2: Model 2 + physical activity. These paths are illustrated from Figure 19 to Figure 38

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CHAPTER 7

DISCUSSION

7 Discussion

This thesis aimed first to test the association between socioeconomic trajectories from childhood to adulthood and five health and physical function outcomes in older adulthood, and then, identify the pathways underlying these associations, assessing the direction of association between life course SEP and health.

The overall working hypotheses were that first, intergenerational social mobility is associated with adult general health, oral health and physical function; second, that the effect of childhood SEP on adult health (social causation) is stronger than the effect of childhood health on adult SEP (health selection); and third, that the outcomes indicating lifetime experience of health and physical function (total tooth loss and grip strength) have a stronger association with intergenerational social mobility than those outcomes more indicative of current health (self-rated general and oral health and oral health related quality of life).

In this final chapter, linked to the two main aims, section 7.1. provides an overview of the findings divided in five sections; section 7.1.1 presents a summary of the main conclusions; section 7.1.2 provides a more detailed discussion by outcome integrating both the regression and pathways analyses; and section 7.1.3, 7.1.4 and 7.1.5 discuss further issues arising from the results.

The rest of the chapter is structured as follows. Section 7.2 addresses the strengths and limitations of this study. Section 7.3 discusses the policy implications arising from the results. Finally, section 7.4 provides some recommendations for future research.

7.1 Summary of findings and discussion of results

7.1.1 Associations and pathways between intergenerational social mobility and adult general health, oral health and physical function

Intergenerational social mobility was associated with all five outcomes, suggesting that exposure to adverse/protective SEP in childhood and adulthood had a cumulative effect on the general health, oral health and physical function of older adults.

Generally, it was found that intergenerational social mobility diminished the positive/negative impact of childhood SEP on general and oral health among men and women, and on physical function only among women. In other words, social trajectories from childhood to adulthood SEP affected how individuals rated their general and oral health, were associated with the presence of natural teeth at adulthood, affected how they rated their oral health related quality of life (measured as at least one oral impact) among men and women, and affected the mean grip strength of women later in adulthood.

However, the associations vary depending on the studied outcome.

Regarding general health and oral health outcomes, the associations with poor self-rated general health and total tooth loss were stronger than the associations with poor self-rated oral health and oral health related quality of life. Moreover, the observed associations between social mobility trajectories and self-rated general health and total tooth loss support an accumulative effect of SEP; while the associations with self-rated oral health and oral health related quality of life showed a different pattern, whereby current SEP had a stronger impact than distal SEP. However, among those individuals sharing the same adult SEP, an accumulative effect of adult and childhood SEP was also identified.

Regarding physical function, the association of intergenerational social mobility with grip strength differed from the previously described associations. Social mobility was associated with grip strength only among women, and while there was weak evidence for accumulative effects, there was no clear graded pattern.

These results partially confirm the first hypothesis of this thesis proposing a linear association between intergenerational social mobility and adult health and physical function. Overall, the general health, total tooth loss levels and grip strength of the mobile individuals tend to be between the levels of the stable individuals from the SEP they left and the stable individuals from the SEP they joined. Nevertheless, these findings also suggest that the social trajectory matters. For example, individuals who experienced upward mobility from low to middle SEP had better health levels than those individuals who experienced downward mobility from middle to low SEP, supporting the relevance of distinguishing between trajectory groups.

Additionally, the potential pathways underlying these associations were explored. Unlike most previous studies that have explored either only one of the intergenerational social mobility theories or looked at the effect of each of these theories on health separately, this analysis measured both social mobility theories using the same model, allowing to determine and compare their relative contribution in the association between social mobility and health and physical function in older adulthood.

Each of the intergenerational social mobility theories postulates a different direction of the association between changes in socioeconomic position and health and function. Social causation theory postulates that SEP affects health, while the health selection theory postulates that health affects SEP.

The findings from this study support the idea that the two social mobility theories are not mutually exclusive and can operate simultaneously. On the one hand, health inequalities emerge as a consequence of social inequalities over the life course, but on the other hand, health inequalities also contribute to the formation of socioeconomic hierarchies.

Regarding the social causation theory, it was observed that SEP in childhood directly impacts on adult self-rated general health, total tooth loss and grip strength; but also exerts an indirect effect on all five outcomes through education, behaviour and adult SEP. In essence, the findings from this study confirmed that childhood and adult SEP are directly and indirectly linked, impacting on adult general and oral health and physical function. Education was identified as the most relevant mediator of the pathways between childhood SEP and health and physical function in older adults.

Regarding the health selection theory, there was a significant direct effect of childhood health on adult SEP, even after accounting for the effect of education. Poor childhood health was indicative of poor adult SEP. However, there was no evidence of an indirect effect of childhood health on adult SEP via education, as childhood health did not directly affect education.

When comparing both theories, for self-rated general health, tooth loss and grip strength, the effect of the social causation path was considerably larger than the effect of the health selection path. In other words, the effect of childhood SEP on older adulthood health and physical function was larger than the effect of childhood health on adult SEP. However, for self-rated oral health and oral health related quality of life, the health selection effect is larger than the social causation effect; associated with the absence of a direct effect of childhood SEP on these two outcomes. These findings partially support the second hypothesis of this thesis that predicted that both social mobility theories would have a significant effect, but that the social causation effect would be stronger than the health selection effect. Overall, for self-rated general health the social causation total effect was three times larger than the health selection total effect; for total tooth loss, the social causation total effect was four times larger than the health selection total effect; and for grip strength the social causation total effect was almost double the health selection total effect among women.

It is likely that the smaller effect of health selection compared to the effect of social causation is associated to the age of the sample. West (1991) claimed that the health selection effect is larger in early stages of life, having a stronger effect on changes from childhood to early adulthood than from childhood to older adulthood, basically because the life-course events were closer in time. Therefore, it could be expected that in older samples, the cumulative effect of SEP has a greater impact on adult health (social causation) than the effect of childhood health on adult SEP (health selection).

Whereas research examining the effect of social mobility on adult health or physical function has been generated mostly on young-adult populations, the findings from this study suggest that health inequalities associated with intergenerational social mobility must be scrutinized in older-age populations as well. The findings from most previous studies using similar analytical models but younger populations are compatible with the results of this study, supporting the coexistence of both social mobility theories, although, researchers have been unable to agree on which theory has a larger effect (Huurre et al. 2005; Haas 2006; Palloni et al. 2009; Warren 2009). The closest comparable study is the one conducted by Warren (2009) which aimed to quantify the causal effect of SEP on health and vice versa using an American population cohort of men and women aged between 18 and 65 years covering the period from 1957 to 2004. Both, this study and Warren's study results provide strong evidence for a social causation effect of childhood SEP and adult SEP on adult general health. Additionally, the current study is the first to provide evidence of a social causation direct and indirect effect of lifetime SEP on oral health and physical function in older adulthood. However, there were also differences between the two studies, with Warren reporting no health selection effect while the results of this study showed a selective effect of childhood health on adult SEP. This divergence may be related to differences in the method used to measure SEP and health. As previously mentioned (section 1.2.1.1) the effect of the social mobility theories may vary across indicators of SEP.

7.1.2 Analysis of results by outcomes

The outcomes can be classified into three groups according to the observed pattern of association with intergenerational social mobility suggesting differences in the predominant life course model.

Association and pathways between intergenerational social mobility and self-rated general health and total tooth loss

As mentioned in the main findings, self-rated general health and total tooth loss were strongly associated with intergenerational social mobility trajectories suggesting a pattern of association that reflects an accumulative effect of SEP on these outcomes. In other words, experiencing different social trajectories results in an accumulation of beneficial or damaging exposures, positively or negatively affecting older adulthood general health and tooth loss. Experience of higher levels of socioeconomic disadvantage over the life course was associated with higher rates of poor general self-rated health and total tooth loss.

Additionally, the pathway analyses showed that a web of interconnected paths explained these associations. A social causation effect was evident: lower SEP in childhood linked to lower SEP in adulthood was indicative of poorer self-rated general health and total tooth loss. Moreover, lower childhood SEP had an indirect negative effect on self-rated general health and total tooth loss in older adulthood via education and behaviour. One advantage of testing several mediators within the same model is that this allows to quantify and compare the magnitude of the indirect effect associated with different mediators (Preacher & Hayes 2008). These results showed that the size of the mediation effect of health-related behaviours (indirect effect coefficient) was markedly smaller than the mediating effect of education.

A health selection effect was also evident: poor childhood health was indicative of lower adult SEP, consequentially impacting on adult self-rated general health and tooth loss. However, the social causation effect was considerably larger (more than three times) than the health selection effect.

Furthermore, the strong mediating effect of education on the pathways between intergenerational social mobility and adult health is worth discussing. Lower childhood SEP was a strong predictor of lower educational attainment, which in turn was indicative of lower adult SEP. This suggests that educational opportunities were strongly determined by socioeconomic background. Furthermore, the effect of educational level on adult SEP was larger than the effect of childhood SEP on educational level, suggesting that, irrespective of their socioeconomic background, individuals that had access to a higher level of education had a greater opportunity to achieve higher SEP in adulthood. This mediating effect of education has been previously reported in other studies (Luo & Waite 2005; Palloni et al. 2009). Nevertheless, Goldthorpe (2016) has pointed out that in the UK, education probably is currently playing a very limited part in the intergenerational social mobility, based on the fact that the relationship between childhood SEP and educational level has strengthened (Breen et al. 2009; Breen et al. 2010), and the association between education and adult SEP has debilitated (Jackson et al. 2005), increasing class inequalities in educational attainment and strengthening the relationship between origin SEP and destination SEP.

Association and pathways between intergenerational social mobility and self-rated oral health and oral health related quality of life

Self-rated oral health and oral health related quality of life (measured as at least one oral impact on daily performance) were also associated with intergenerational social mobility, but the association was weaker than the one observed with poor self-rated general health and total tooth loss. Moreover, the pattern of associations was also different, revealing a gradient according to adult SEP, suggesting a predominant critical period effect of adult SEP than an accumulative effect of SEP. In other words, proximal SEP had a stronger effect than distal SEP on self-rated oral health and oral health related quality of life. Individuals with lower adult SEP reported worse self-rated oral health, and worse oral health related quality of life. However, overall, among individuals who shared the same SEP there was some, but rather weak, evidence for an accumulative effect whereby those in higher childhood SEP rated their oral health related quality of life better than those from lower childhood SEP. Adjustment for education and smoking status explained these associations.

The pathway analysis suggested that childhood SEP had no direct effect on self-rated oral health and oral health related quality of life in adulthood. However, an indirect effect of childhood SEP via education and behaviour was identified. Several authors have shown that a significant direct effect (in this case of childhood SEP on adult oral health) is not necessary for mediation to occur (Collin et al. 1998; MacKinnon 2000). This finding is in line with the lack of association observed in the regression analyses after adjustment for covariates. However, these weaker associations may also be due to the age of the sample. The prevalence of poor self-rated oral health and at least one oral impact might be underestimated in an older population that could adapt their perceptions and expectations on what is good/poor oral health as they aged, perceiving oral diseases as part of the aging process and therefore under-report them (Carr et al. 2001). It also might be that some risk factors, such as tooth loss, have opposite effect in different individuals (Slade et al. 1996). For example, for some individuals tooth loss can have a negative effect on oral health related quality of life affecting daily function such as chewing or smiling; whereas for other individuals tooth loss might result in pain relief, and therefore their quality of life improves (Locker 1998). Accordingly, it has been documented that, paradoxically, people with total or partial tooth loss tend to rank their oral health as good (Slade & Sanders 2011). This was also observed in this cohort (section 4.3.3). However, no differences were observed in the association between social trajectories and self-rated oral health and oral impacts between dentate and edentate individuals (section 5.6.3). Further studies exploring these associations in different cohorts with similar characteristics are needed to confirm the association between intergenerational social mobility and self-rated oral health, and oral health related quality of life in a population aged 50 years and over.

The findings of this study are generally consistent with most literature exploring the effect of intergenerational social mobility on adult self-rated general and oral health in younger samples. The literature generally found, with some exceptions (Davey Smith et al. 1997; Rahkonen et al. 1997; Power et al. 1999; Iveson & Deary 2017), a strong association between intergenerational social mobility and general self-rated health (Nyström 1992; Hart et al. 1998; Elstad 2001; Singh-Manoux et al. 2004; Elovainio et al. 2011) and self-rated oral health outcomes (Thomson et al. 2004; Bernabé et al. 2011; Delgado-Angulo & Bernabé 2014; Brennan & Spencer 2015; Han & Khang 2017).

Direct comparison with all these studies is difficult as they refer to much younger cohort, not covering older adults. Furthermore, whereas most studies on social mobility have narrowed their attention to specific health fields, this study documented that intergenerational social mobility affects more than one health domain. There is only one previous study exploring the association of social mobility with general health and oral health in the same sample: Poulton et al. (2002) conducted a study on a young-adult population (aged 26 years old) in New Zealand. Like in the findings of this study on older adults, their results supported a significant effect of intergenerational social mobility on a wide range of general health and oral health outcomes but among young adults.

Additionally, because most previous intergenerational social mobility research has been restricted to only male samples (e.g, Hart et al. 1998; Krzyżanowska & Mascie-Taylor 2011; Elstad 2001), with some exceptions (e.g. Hart et al. 2008; Elovainio et al. 2011); and to only working populations, less is known about how intergenerational social mobility influences adult general health and oral health among women and economically inactive individuals. This research found that intergenerational social mobility affects adult general and oral health in men and women in a similar way. These results are consistent with the study conducted by Luo & Waite (2005) who reported a similar cumulative effect of SEP in self-rated general health for both genders in an American adult population. Also, the observed effect of intergenerational social mobility on individuals out of the labour market corroborates the findings of Han & Khang (2017), who documented a graded association between intergenerational social trajectories and oral health in a Korean population aged 50 years old and over including unemployed and retired individuals.

Association and pathways between intergenerational social mobility and grip strength

Grip strength showed a different association with intergenerational social mobility trajectories than those observed for general and oral health outcomes. As mentioned, only women showed strong differences in grip strength by social trajectories. Generally, increased levels of socioeconomic disadvantage over the life course were associated with lower grip strength among women. However, this cumulative effect was inconsistent.

However, the pathways analysis showed slight differences by gender. For both genders the social causation effect (SEP on grip strength) was about two times larger than the health selection effect (childhood health on adult SEP). Nevertheless, the social causation pathways were slightly stronger among women. In other words, these results indicate that lower childhood SEP had a slightly stronger direct and indirect negative effect on women's adult grip strength than on men's. Women from lower SEP were more likely to obtain a lower educational level than men from the same background. In turn, educational level had a slightly stronger impact on adult SEP among women than among men. Therefore, the different associations between intergenerational social mobility and grip strength between genders might be due to women in this cohort presenting less favourable socio-demographic characteristics, such as lower educational level. However, these differences are not large enough to account for the different association between men and women. A second explanation may be related to how socially patterned exposures impact on different outcomes. For example, manual work, predominantly associated with lower SEP, may act as a protective factor for grip strength but as a damaging factor for general health. This would also explain the differences between men and women. In fact, gender differences in health and physical function have been previously explained in terms of different roles and lifestyles (Gijsbers Van Wijk & Kolk 1997). However, this idea is controversial. For example, a study exploring the relationship between manual work and later physical function suggested that harder working-related physical activity does not act as a protective factor (Beltrán-Sánchez et al. 2017).

Additionally, two unexpected findings were observed in the pathway analysis. First, among men it was found that lower childhood SEP was indicative of higher adult grip strength. This contradicts the findings of the regression analysis that showed a significant gradient where lower childhood SEP was indicative of lower adult grip strength. These differences between analyses can be explained when both the indirect and direct effect of childhood SEP in adult grip strength are accounted in the SEM analysis. The total indirect effect via education and behaviour was considerably larger than the direct effect of childhood SEP on adult grip strength. Even so, a possible explanation for the unexpected remaining direct effect of childhood SEP on adult grip strength might be associated to the parental SEP classification. It may be that some of the paternal occupations classified as low SEP can exert a protective effect on adult grip strength. For instance, a farmer's boys have better functional performance in adulthood than their peers from even higher SEP (McCrory et al. 2015). However, the evidence of a direct effect of childhood SEP on adult grip strength was weak at best, and if there was an effect it was very small. The second unexpected finding was that among women the results showed that current smokers had higher grip strength measurements than those reporting being never smokers and ex-smokers. An important related methodological limitation is that in this study the variable smoking status was measured at the same time as grip strength, therefore the temporality is not clear; it might be that women who are current smokers started smoking later in life and have not yet accumulated the potential negative effect of smoking on grip strength. Further studies using panel data could help to better elucidate this association.

There are few studies examining the effect of intergenerational social mobility on adult physical function, but only one study has explored the association between intergenerational social mobility and clinically measured grip strength (McCrory et al. 2015). This was carried out on Irish men and women aged 50 and over and their results differ from the results presented in this study. The McCrory study reported that intergenerational social trajectories had no impact on grip strength. Furthermore, there is no previous study exploring the effect of the social mobility theories on adult physical function, this study is the first one.

The complexity of these results suggests that there may be other variables that need to be accounted in order to explain the findings. Further research, including other physical function outcomes and control variables, such as job-related physical activity, is needed to increase the understanding of the association between intergenerational social mobility and adult physical function.

7.1.3 Variations in results by outcomes

The reasons for differences in the associations between intergenerational social mobility and the studied outcomes have been partially explained through the previous sections. This study analyzed five indicators of general health, oral health and physical function reflecting different aspects of current and historical health and function. The outcomes include clinical measures and multidimensional evaluations of health. They are: self-rated general health and self-rated oral health, an overall contemporary subjective evaluation, capturing the cumulative effect of acute and chronic diseases, including clinical and subjective features of health (Idler & Benyamini 1997; Benyamini et al. 2004). Total tooth loss, an irreversible condition that represents total tooth mortality (Tsakos et al. 2011) and a long-term accumulation of oral disease and treatment experience (Baelum et al. 2007), has also been used as a physical function measure (Petersen et al. 2005). This study also used the prevalence of oral impact, calculated through OIDP, a measure of oral health related quality of life that incorporates functional, psychosocial, and social aspects of daily life negatively affected by oral health (Tsakos et al. 2001). Finally, grip strength is a clinical measure of physical function capturing the long-term accumulation of exposures affecting physical function.

The results revealed that the association between social mobility and the alternative theories, social causation and health selection, vary across the five outcomes used in this study. This is in line with the conclusion postulated by Kröger et al. (2015) that the effect of the social mobility theories, social causation and health selection, might differ depending on the studied outcome.

The observed associations were slightly different to the hypotheses put forward in this thesis. The third and last hypothesis stated that the three outcomes most associated with current health (self-rated general health, self-rated oral health and oral impacts) would have weaker associations with intergenerational social mobility than the two outcomes most associated with long-term health (total tooth loss and grip strength). This was only partially confirmed. Indeed, total tooth loss and grip strength were strongly associated with intergenerational social mobility. However, self-rated general health as an indicator more related with current situation needs to be reconsidered. As mentioned, self-rated general might be more indicative of a combination of current and long-term chronic conditions. In fact, authors, such as Goldstein et al. (1984) and Pope (1988) empirically showed that self-rated general health is predominantly associated with long-standing chronic conditions rather than acute transitory conditions. Moreover, later studies have also confirmed a strong association between self-rated general health and long-standing health conditions (Lundberg & Manderbacka 1996; Manderbacka 1998). A second explanation may be related with how individuals judge their health, which might be more associated with the health trajectory based on several aspects of health such as mental health, disabilities or health family history (Idler & Benyamini 1997). A third explanation may be related with a sociological effect of social mobility on health (Blane et al. 1999a). Individuals might interpret their health differently depending on their social environment, causing a strong association even when the health indicator is more indicative of current than long-term health, reflecting a dynamic rather than a static perspective of health. The concept of this sociological effect is further explained later in section 7.1.4.

Finally, it is interesting that self-rated general health and self-rated oral health showed different associations with intergenerational social trajectories, given that these outcomes are interrelated, oral health is an integral part of general health and general health affect oral health (Benyamini et al. 2004). However, how individuals perceive their oral health is not well understood (Sanders & Spencer 2005). It might be that access to restorative dental treatment affects oral health perception, which would explain why self-rated oral health is more related with current situation, while self-rated general health is more related with long-term conditions that often are more difficult to manage.

7.1.4 Health inequalities: gradient constraint effect

Interpreting whether intergenerational social mobility reduced or increased health inequalities in older adulthood is beyond the scope of this study. However, this is a very relevant discussion and most studies on intergenerational social mobility have focused their attention on this subject.

The findings of this study are in line with the idea proposed by previous authors that social mobility reduces health inequalities (Blane et al. 1999b; Bartley & Plewis 2007); since individuals who change SEP had intermediate health levels, between the levels of the stable individuals from their initial SEP and the stable individuals from the destination SEP.

According to Sacker et al. (2005) a possible mechanism of how social mobility might reduce health inequalities, and produce a "gradient constraint effect", is through an accumulation of socially patterned protective/damaging exposures. Socially mobile individuals accumulate more heterogeneous disease risk levels over time than individuals who remain stable in one SEP. Therefore, those moving upward contribute greater levels of disease risk to the destination socioeconomic group, and those moving downward contribute lower levels of disease risk, producing an equalizing effect between socioeconomic classes. Blane et al. (1999b) proposed an alternative mechanism, suggesting that SEP may have a "sociological" effect. They proposed that health is a relative concept influenced by the social environment therefore, the concept of what is understood as good/poor health can change from one SEP to another. For example, it might be that individuals from a lower SEP considered good health as not having a limiting disease, while individuals from a higher SEP might consider that good health implies higher levels of well being. Therefore, individuals who move upwardly might rate their health as good when compared to their peers from the initial class, but then rate their health as poor when compared with their peers from the destination class, and the contrary effect for those moving downwardly. This "sociological" mechanism fits the observed differences in the self-rated health measures, but does not explain the differences observed in clinically measured outcomes such as grip strength. Therefore, it is possible that the constraint of health inequalities is caused by different mechanisms acting at the same time. These two mechanisms are compatible with the social causation theory. However, other authors like Francis Galton (in Macintyre 1997, p.724; Black et al. 1982, p. 105) have proposed that health differences by social class might occur because of a "hereditary" effect that is compatible with the health selection theory, those with better health would move upward and those with worse health would move downward. The results of this study support both causation and selective theories, though the support is much stronger for the social causation theory.

7.1.5 Prevalence and associated characteristics of intergenerational social mobility trajectories

Lastly, this is the first study to explore intergenerational social mobility trajectories in the ELSA cohort. Therefore, this study contributes to information on the prevalence of occupational intergenerational social mobility in the population aged 50 years and older living in England, and adds information about the sociodemographic characteristics associated with each social mobility group.

This study used two analytical samples, named according to the wave that was used for the analysis: wave 3 and wave 4 (section 3.2.1). Similar distributions of intergenerational social mobility trajectories were observed in both samples. This was expected as these are consecutive waves from the same cohort and therefore most of the individuals were the same (n=7043, about 81% of wave 3 and 72% of wave 4). In both analytical samples, about 40% of the individuals remained stable in the same SEP over time, while 60% changed SEP between childhood and adulthood. Moving downward was slightly more common than moving upward and most mobility occurred from the middle SEP.

The observed distributions of sociodemographic characteristics by social trajectory were also very similar between both analytical samples (wave 3 and wave 4). Generally, younger, highly educated, employed, and married respondents were more frequent in those trajectories that moved upward and in the trajectories with high SEP at adulthood. Also, the individuals who reported good childhood health were more likely to move upward, and the individuals who reported poor childhood health were more likely to move downward from childhood to adulthood.

These results seem to be in line with other studies exploring intergenerational social mobility in the population living in England. Bukodi et al. (2015) studied the absolute intergenerational social mobility rates (percentage of individuals in certain trajectory group at a certain time point) of two British birth cohorts (1958 and 1970), with adult SEP measured at age 38 and age 27 respectively. They report that mobility rates were about 79% in both cohorts independent of the adult age considered (27 or 38), and that upward mobility was more predominant than downward mobility among men. This study as well the results of this thesis indicate high rate of intergenerational social mobility for these cohorts in England. This higher rate of mobility found by Bukodi and collaborators might be related with the fact that they used a 7-class version of NS-SEC, which might be more sensitive to changes from childhood to adulthood SEP than the 3-class version used in this study. In fact, Goldthorpe (1987) conducted a study using data from a representative sample of employed men living in England aged between 20 and 65 and used a 3-class version of NS-SEC very similar to the one used in this study. He reported that about 50% of the sample experienced social mobility from childhood to adulthood. However, he also reported that upward mobility was more predominant than downward mobility. The differences between the prevalence of intergenerational social mobility of this study and the Goldthorpe study may be related to the fact that this study used an older population. Goldthorpe (2016) recognizes that mobility has a cohort effect, and that older cohorts tend to show higher rates of downward mobility than younger cohorts. But the rate differences might also be due to the fact that this study includes women. Bukodi et al. (2015) using British data and NS-SEC reported that mobility rates are slightly higher among women than men. The same author also reported that downward mobility rates are more prevalent among women (Bukodi et al. 2015; 2016), probably associated with the caring role of mothers that women are still more prone to adopt, being consistent with the rates found in the current study.

7.2 Strengths and limitations of this study

7.2.1 Strengths

One strength of this study is the use of a large-scale and nationally representative survey data. ELSA is a unique dataset that includes high-quality information about SEP and adult health across the life course for a representative sample of individuals living in England aged 50 years and over. This rich data set includes information on health, socioeconomic position and a wide range of confounders and mediators, allowing to enrich this study field by contributing to the limited literature about the effect of long-term social mobility on adult health and physical function, extending the previous findings on younger populations to older adulthood. Additionally, the analytical sample is large, permitting adequate statistical power even after applying the exclusion criteria.

Another advantage of this study relates to the characteristics of the analytical approach. This study used a trajectory approach, enabling the examination of the impact of change of SEP over time. Other studies have explored this only accounting for the cumulative effect of childhood and adult SEP (e.g. Davey Smith et al. 1997; Marmot et al. 2001; Naess et al. 2004). Studies based on SEP accumulation may capture lifetime SEP experience, but are limited in terms of considering timing of exposures, in other words, the use of a cumulative model assumes that a specific exposure has the same effect independently of the life stage when it occurs, while a trajectory approach accounts for the different effect that an exposure can have at different life stages such as childhood and adulthood (Pollitt et al. 2005).

Moreover, it is worth highlighting the novelty of this study and its capacity to create bridges with other health disciplines. This is the first study to analyse the effect of social causation and health selection social mobility theories on the same model, using oral health and physical function outcomes. This helps to improve our understanding of how social determinants of health impact on a wide range of health fields (WHO 2008). Furthermore, it also contributes to generating links between different health sectors.

Lastly, the use of structural equation modelling in chapter 6 is a strength by itself. These models allow to explore the dynamics of the associations between SEP and health across the life course, accounting for errors in measured variables (Raykov & Marcoulides 2006). This methodology permits combined modelling of two causal relationships simultaneously enabling their direct comparison. As a result, the effect of different pathways and processes sharing common variables can be simultaneously explored.

7.2.2 Limitations

This analysis has also some limitations. First, although these results are based on a data set that gathered longitudinal information, the social trajectories were created using retrospective and cross-sectional data. Longitudinally collected data of life course SEP and health outcomes would be preferable as it enables stronger inferences about the pathways between SEP and health, and creates clarity about temporality of exposures.

Moreover, as childhood measures (SEP and health) were obtained retrospectively, it might be argued that this could be subject to recall bias. The ideal scenario, although challenging, would be to obtain long-term longitudinal data on these variables. There is no way to remedy this for the ELSA data. However, studies exploring the validity of retrospective reports on parental occupation have documented that individuals are able to report parental occupation with considerable reliability even in old age (Bielby et al. 1977; Hout & Hastings 2016). Similarly, Smith (2009) empirically demonstrated that older individuals are able to accurately report their childhood health. Even so, other authors have suggested that retrospective reports of the ELSA cohort could indeed include recall bias, and that the prevalence of child health conditions could be underestimated (Jivraj et al. 2017).

In addition, the use of occupation-based SEP can be a potential limitation for a sample of older adults that includes pensioners, because it represents only one dimension of SEP (Galobardes et al. 2007) and might not be the best SEP indicator to use when a considerable proportion of the sample is retired (about 60%), with their last occupation potentially being in the distant past (Demakakos et al. 2015). Other SEP indicators, such as wealth, have been suggested as more relevant for older adults at pension age. The ELSA sample spans across a wide age range that consists of both economically active (and in occupation) as well as retired participants, therefore measuring SEP in such a sample of older adults is particularly challenging. However, determining which SEP indicator is the best for a particular sample relies on the research question. Furthermore, it is important to consider that there is no ideal single SEP indicator, and that all indicators are context dependent (Grundy & Holt 2001). The ideal scenario would be to use a multilevel indicator of SEP (individuals, household) combining several indicators. The availability of the data did not allow to construct a multilevel aggregate SEP variable on childhood and adulthood that would also facilitate the assess relevant intergenerational social trajectories. Nevertheless, occupational class has been recognized as a reliable indicator of social inequalities in health in older adult samples (Krieger et al. 1997; Grundy & Holt 2001). Moreover, it is also the most widely used SEP indicator in intergenerational social mobility research conducted in industrialized countries, as occupational class is simple and reliable to collect and is available in most census and cohort studies (section 1.2.1.1). This is an advantage as it allows a comparison with other studies. Furthermore, occupation-related SEP was measured at the head of household level, which has been reported to be more informative than the participant's occupation when the data includes women (Koskinen & Martelin 1994; Sacker et al. 2000). This approach is particularly advantageous when older populations are studied (Grundy & Holt 2001), where it is expected that a high percentage of women have taken house related roles. Lastly, a household approach can also account for those cases when one individual is retired but still living with someone economically active.

Linked to this is also the issue of the complexity of coding socioeconomic position measured at different time points (childhood and adulthood). As discussed in Appendix A, the employed methodology for classifying SEP in adulthood and childhood will never be perfect. The respondent's own occupation was classified according to the NS-SEC scheme. However, the respondent's paternal occupation was classified into groups differently as there was not enough information to perfectly fit paternal occupation information into the NS-SEC classification. It is possible that some changes in SEP could be partly due to misclassification and this might have had an influence on the results of this thesis. However, the method used aimed to classify paternal occupation in a way that was as similar as possible to the NS-SEC scheme. This was done by considering the UK occupational social class classification guidelines (SOC and NS-SEC) and also how other authors using the same data previously had classified SEP (for more details, please see Appendix A). Therefore, the potential influence of this imperfect classification of occupations is not expected to be large. Ideally, ELSA would include further information regarding occupational class at both life stages to allow a more homogenous classification of paternal and own occupational class.

Another limitation of this study is that childhood socioeconomic position was categorized using only paternal occupation. It would be preferable to include maternal occupational class as well, and select the higher occupation through the already explained dominance method (section 3.3.2.1). ELSA data did not allow this; the information on maternal occupation is not available. However, Bukodi & Goldthorpe (2016) reported that the paternal and dominance methods have no significant difference in the overall strength or in the pattern of association between initial and final SEP.

7.3 Relevance of the findings and policy implications

The rationale for identifying how intergenerational social mobility affects adult general and oral health and physical function is of relevance for public health policy because it provides scientific evidence to inform appropriate policy development. A careful understanding of the associations between lifetime SEP and health is necessary before public health policy makers can elaborate effective policies to reduce health inequalities in older adulthood; but also, provides information to anticipate health and physical function problems that may be expected because of socioeconomic changes of the society.

7.3.1 Implications for the designing of public health policies

The results of this study support the co-existence of a social causation and health selection effect, but with a clearly stronger role for the former, suggesting that the impact of SEP on health is markedly larger than the impact of health on SEP. On the one hand, these results recognize that policies focused on improving childhood health conditions, such as improving access to health care or improving education/employment prospects for those children with chronic diseases, should have a long-term effect on adult SEP, health, and physical function. But, on the other hand, the results also support the fact that policies focused on improving SEP conditions, during adulthood and childhood should have a larger effect on adult health and physical function.

Also, this study supports the policy that promoting intergenerational social mobility is favourable to reducing health inequalities and therefore is an objective to be pursued. However, there are some authors who state that enhancing meritocracy would increase the social differences in health. Authors like Friedman (2014) have claimed that intergenerational social mobility can cause stress and emotional problems not necessarily being beneficial to health and sometimes even harming health. However, this study and most of the reviewed evidence challenge this idea.

Accordingly, the results of this study provide important evidence supporting the relevant impact of socioeconomic factors on health and physical function in older adulthood, counteracting the focus on individual lifestyle factors and victim-blaming which all too often characterises policies (Marmot & Bell 2010). If the aim is reducing health inequalities in older adulthood public health policies can target the causal chain at different levels. Policies that target individual level changes, such as changes in behaviours (e.g. improved physical activity or reduced smoking) would indeed have an effect on adult health and physical function. However, these results support the fact that targeting wider social determinants of health, such as childhood and adulthood SEP, should be a more effective policy strategy, as they affect individual level factors such as behaviours. Correspondingly, Marmot (2005) had already pointed out that targeting the "causes of the causes" is a more effective approach to improve the population health. Therefore, policy makers should promote policies focused on topics like employment opportunities and/or income redistribution. These policies would give individuals a better start in life but also the opportunity to diminish the negative impact of a disadvantaged childhood.

Furthermore, the results of this study and the findings from the literature reviewed extensively recognize that education is a relevant mediating factor in reducing the influence of the initial SEP on the destination SEP. Furthermore, education directly affects adult health and physical function. Therefore, policies aimed at weakening the influence of childhood SEP on educational attainment and promoting equal education for everybody, regardless of their socioeconomic background, should promote intergenerational social mobility and potentially reduce health inequalities in older adulthood.

Lastly, the results from this study provide evidence of the existence of common underlying factors impacting different health domains, suggesting that strategies for improving older adult health and function should adopt a common risk factor approach. The potential benefit of a multi-sectorial working approach is to converge efforts and target the limited resources for the policies that will have the highest impact.

7.3.2 Expected effect of socioeconomic changes of population on health

In the UK, there is no consensus how mobile the society is; in fact, this is a very controversial subject. The Social Mobility Commission has recently published a report suggesting that in the UK social mobility has become flatter (Milburn et al. 2016), and there is evidence that social mobility rates are decreasing (Blanden et al. 2004). If this is the case, the paternal SEP would have a higher influence on future individual adult SEP than 20 years ago. This means that public policies focusing on childhood conditions would be very valuable. However, this also suggests that enhanced policies are needed focusing on stimulating higher social mobility. However, other authors such as Bukodi et al. (2015) have published strong evidence claiming that the levels of intergenerational social mobility in the UK have not declined overall and mobility rates among women in particular have tended to increase. They suggest that the problem in the UK is about the balance between upward and downward mobility, with a higher prevalence of downward mobility. If Bukodi and collaborators are correct, the results of the present study predict that an increase in downward mobility will probably cause a long-term unfavourable impact on adult general health, oral health and physical function.

Even so, a reduction of health inequalities should occur even if downward mobility rates are higher than upward mobility rates. Just an improvement on the absolute mobility rates should result to an equalization of health and physical function levels by socioeconomic position. However, it is evident that is better to promote greater upward mobility rates and lower downward mobility rates, seeking that upward mobility predominates over downward mobility, this can be done by supporting policies that can help to create more space in the higher socioeconomic classes (Goldthorpe 2016); for example, promote economic policies such as increased investment in technological advances which can help create more "top-end" jobs (Atkinson 2015), especially when upward mobility has been associated with positive health outcomes. In that sense, policy makers need to balance between policies that reduce the health selection effect, but promote intergenerational social mobility.

7.4 Recommendations for future research

This study aimed to provide new information about the association between intergenerational social mobility and adult health and physical function. Given the complexity of the causal chains between SEP and health it is not realistic to expect that a single study can encompass all the factors and pathways that connect SEP and health. The understanding of the pathways needs to be built incrementally from different research focusing on specific pathway segments (Braveman et al. 2011).

The complexity of the findings in this study highlights the need for further research on the association between intergenerational social mobility and general health, oral health and physical function in older populations.

Several areas of further research have been identified throughout the discussion chapter. First, there are only a few studies exploring the effect of intergenerational social mobility on health in an older population. Results from other studies exploring the same set of associations in different cohorts of the same age would increase the evidence and understanding of the long-term health effect of changes in SEP over the life course.

Second, different SEP indicators capture diverse dimensions of socioeconomic position. As mentioned in section 1.2.1.1 the choice of the most appropriate SEP indicator is both relevant and challenging. There is no single "best" indicator and each indicator represents a different dimension of socioeconomic position, which may also be associated differently with a particular outcome. Replicating the same study with a different SEP indicator would contribute to elucidating the factors associated with SEP that have a stronger/weaker effect on adult health and physical function. Furthermore, SEP indicators might be explored individually but also as a latent variable reflecting the complexity of the socioeconomic position construct. ELSA includes other variables that can also be used as SEP proxies of childhood and adulthood SEP, such as the number of books in the household, access to household amenities during childhood, educational level, housing tenure, wealth and subjective SEP. However, the use of these variables to construct trajectories must be done with precaution as they measure different aspects of SEP.

Third, future research should focus on gaining further understanding about the potential mechanisms linking SEP and adult health and physical function. Other pathways connecting SEP and health need to be hypothesized and tested. The current study results might be affected by the selection of variables. Future studies that incorporate other confounders and mediators might help to unravel information about pathways not addressed in this study. The richness of the ELSA data allows to explore the relationship between intergenerational social mobility with a broad array of longitudinally collected biomarkers such as lung function, body mass index, cardiometabolic factors and markers of systemic inflammation among others, thereby facilitating the assessment of potential pathways that link social mobility and health and function. Moreover, other explanatory variables that have been previously associated with physical function but also for the other outcomes studied here, such as social networks (Mendoza-Núñez et al. 2017), should be considered as potential mediators.

Fourth, further research is needed to disentangle the underlying mechanisms of the association between physical function and intergenerational social mobility. Although, the results of this study suggest a significant association, they do not allow a comprehensive understanding of how social mobility relates with adult physical function. Grip strength has been previously recognized as a good marker of physical function in older adulthood and is therefore the most commonly used measure of physical function (Cooper et al. 2011). However, further studies can incorporate also other measures of physical function that are collected in ELSA such as walking speed and chair rise time. This complementary use of alternative physical function markers may help further unravel how social mobility affects function in older adulthood. Furthermore, other confounders such as body mass index can be explored to increase the understanding of the associations between physical function and intergenerational social mobility.

Finally, due to the availability of the data this study, SEP was measured only at two periods in life (childhood and older adulthood). This assumes that SEP does not change more than once in a lifetime, an assumption that could be challenged. In fact, the repeated data across ELSA waves includes the measurement of both SEP and the outcomes over a period of time in older adulthood, though most outcomes were not measures across all waves; for example, oral health related outcomes (total tooth loss, self-rated oral health and oral health related quality of life) were measured only at wave 3 and 5 (and now wave 7 data has also been available). The repeated measurement of outcomes could have been used in this analysis, but there was only minimal change in the prevalence of some of them (e.g. total tooth loos) across waves and therefore this would not have added considerably to the findings for those outcomes while it would have further complicated comparissons across different outcomes due to the different nature of the analytical approach taken. For the SEP measures, it is possible that the different waves of ELSA could have been exploited to get more reliable estimates and account for changes in SEP across older adulthood. A similar approach could not have been used for childhood SEP, as there was only one measurement through the restrospective life history questionnaire.

However, the current study is focused on intergenerational social mobility distinguishing intra from intergenerational social mobility. Intergenerational mobility looks at the changes in SEP across generations and intragenerational mobility focusses on changes in SEP for the same individual. How intragenerational social mobility affects the relationship between health and SEP is beyond the scope of this study. However, it is relevant to mention that intergenerational social mobility encompasses intragenerational social mobility, especially if the adulthood SEP is measured in older adulthood. Therefore, it might be that the observed associations are in part explained by intragenerational social mobility. Indeed, it has been observed that these two types of mobility are not independent of each other, as there is an inheritance effect of occupational social class (Breen & Goldthorpe 2001), meaning that the individual's SEP is strongly dependent on the paternal SEP. These two types of mobility might affect health in different ways. As mentioned in section 1.2.1.4, socioeconomic factors can operate differently throughout the lifespan. SEP in childhood can have long-term effects on health, irrespectively of SEP in adulthood, but it might also be that later SEP can have a stronger effect on current health. Further studies should evaluate these associations using intragenerational social mobility measures. Path analyses, such as the one used in this research is a useful tool to facilitate understanding of how these two types of social mobility relate to each other, and which one has a stronger effect on health.

7.5 Conclusion

This thesis contributes to better understanding in how changes in SEP over the life course associate with older adult's general health, oral health and physical function. The results provide evidence that exposure to adverse/protective SEP in childhood and adulthood has a cumulative effect on the general health and the oral health of older men and women and on the physical function of women at older adulthood, suggesting a bidirectional relationship between SEP and health. A social causation effect and a health selection effect were recognised, changes in SEP over the life course causes health differences in older adulthood, but at the same time, childhood health differences cause changes in SEP. However, the observed effect of SEP on health was considerably larger than the effect of health on SEP providing stronger support for the theory of social causation rather than health selection. In that context, promoting public health policies targeting the social determinants of health and promoting intergenerational social mobility are likely to be effective approaches to reduce health inequalities in older adulthood.

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APPENDICES

Appendices

Appendix A. Used criteria to decide how to classify paternal occupation into a three childhood SEP classification

The aim of section 3.3.2.1 was to classify parental occupations to create social trajectories from childhood to adulthood. The individuals own adult occupations were classified using the three category NS-SEC scheme. Therefore, the parental occupations were classified as similar as possible to that scheme.

Based on what have been done from previous research (Demakakos et al. 2012; Vanhoutte & Nazroo 2016), some of the paternal occupations were very clear on how to be classified. But there was no straightforward way to decided how to map some occupational categories such as “skilled trade group” on a three SEP classes scheme.

In ELSA, the question about parental occupation was an open question. The answers were coded into 18 pre-specified categories. More than 25% of individuals were categorised within the “skilled trade” parental occupation group, being a very vague classification, making unclear if it is more correct to classify these individuals within the middle or the low SEP group. To decided, different SEP guidelines were considered:

1. <u>UK occupational social class classifications guidelines (SOC and NS-SEC)</u>

First, the UK occupational social class classifications guidelines (SOC and NS-SEC) were considered.

The Office of National Statistics and SOC2010 classification defined skilled trade occupations as: “*Occupations whose tasks involve the performance of complex physical* *duties that normally require a degree of initiative, manual dexterity and other practical skills. The main tasks of these occupations require experience with, and understanding of, the work situation, the materials worked with and the requirements of the structures, machinery and other items produced. Most occupations in this major group have a level of skill commensurate with a substantial period of training, often provided by means of a work-based training programme*". Examples included: skilled metal, electrical and electronic trades supervisors; construction and building trades supervisors (ONS 2010a), motor mechanic, sewing machinist, printer, baker, chef, among others (ONS, 2010b).

If the three-category NS-SEC table (Figure 43) is considered, it could be argued that this table suggests that "skilled trade" occupations should be classified under the third category: "Routine and manual occupations". But is not very clear. Therefore, more information was needed.

2. The Goldthorpe Schema

Second, the Goldthorpe occupational class schema was considered (Goldthorpe 1987). The NS-SEC classification is based from a previous sociological classification known as the "Goldthorpe Schema", which aimed to differentiate positions within the labour market based on the "employment relations".

John Goldthorpe is the author of this schema. In his book "Social mobility and Class Structure in Modern Britain" (Goldthorpe 1987, p. 40-43) suggested that occupations must be classified according their employment conditions, recommending the following schema:

2.1 “White collar classes”:

I. Higher grade professionals, administrators, managers and large proprietors.

II. Low grade professionals, administrators, manager in small business, higher grade technicians.

These occupations exercise some degree of authority and discretion in the performance of their work giving them freedom and control, and their incomes are generally secure and likely to rise over the time.

2.2 “Intermediate Class”

III. White collar labour force, clerical, sales personnel.

IV. Small proprietors including farmers, self-employed artisans, other own-account workers.

V. Lower grade technicians, supervisors of manual workers.

These occupations share that they have reasonable employment security, some exercise of authority, reasonable income, but are subject of close monitoring from above.

2.3 “Working class”

VI. Skilled-manual wage workers in industry.

VII. Manual workers, agricultural workers.

Goldthorpe suggested that even when the individuals on group VI tend to have higher income and job security than individuals from group VII, these occupations have in common that “*they sell their labour power in more or less discrete amounts* *in return of wages…and they are place in an entirely subordinate role…*" (Goldthorpe 1987, p.42).

Again, this classification is suggesting that "skilled trade" could be classified within the third category. According to Goldthorpe, "skilled manual" occupations are part of the lower class (working class/low SEP). However, the classification "skilled trade" might include manual and non-manual workers, with some occupations more suitable to be classified on the intermediate class. In that direction, Goldthorpe also recognized that all these categories can overlap. He mentioned that some of the occupations classified in the intermediate class and working class can easily be interchangeable. Therefore, this schema does not always have a consistent hierarchical form. Moreover, based in the definition and examples mentioned at the first point, it seems that "skilled trade" occupations might be classified within the intermediate which includes supervisors of manual workers who exercise some authority but are subject of close monitoring at the same time.

3. <u>Conceptual basis of NS-SEC</u>

Third, NS-SEC conceptual basis was considered. The NS-SEC schema was constructed based on employment relations, recommending the following classification of occupations (Donkin et al. 2002, page 25):

3. 1 "Service relationships"

> Those occupations were the employee renders "service" to the employer in return for compensation in term of immediate reward (e.g., salary) and long-term benefits (e.g. career opportunities).

3.2 “Labour contract”

Those occupations were the employee gives discrete amounts of labour in return for a wage calculated on amount of work done or by time worked.

3.3 “Intermediate”

Forms of employment regulations which combine aspect of service relationships and labour contract.

Under this criterion, it seems correct to mapped the “skilled trade” group within the labour contract group, as is reasonable to think that most of the individuals classified as “skilled trade” gave some labour in exchange of a wage calculated by worked done or time worked, with no long-term benefits.

4. <u>Previous occupational SEP classifications</u>

Fourth, how occupations have been historically classified was considered. The Registrar General Social Class was considered. This scheme has been the principal occupational classification used in the UK since 1913 (Stevenson 1928). This classification is based on skills levels associated with each occupation. The last revision of the Standard Occupational classification (SOC2010) suggested the classification of four classes or levels (ONS, 2010a):

4.1 “Fourth level”

Managerial and professional occupations.

These occupations require a degree and relevant work experience.

4.2 “Third level”

Associate professional and technical occupation.

Variety of trades and small business proprietors.

Administrative and secretarial occupations.

These occupations need a body of knowledge associated with a period of post-compulsory education but not normally degree level.

4.3 “Second level”

Administrative occupations.

Customer service occupations.

Machine operators, driving occupations.

Retailing, clerical, secretarial occupations.

These occupations require the knowledge provided via a good general education but which typically have a longer period of work-related training.

4.4 “First level”

Elementary occupations: examples of occupations include postal workers, hotel porters, cleaners and catering assistants.

These occupations usually require a general education, and may require short periods of work-related training.

The previous revision (SOC2000) suggested the following hierarchy:

Group 1: Managers, Directors and Senior Officials

Group 2: Professional Occupations

Group 3: Associate Professional and Technical Occupations

Group 4: Administrative and Secretarial Occupations

Group 5: Skilled Trades Occupations

Group 6: Caring, Leisure and Other Service Occupations

Group 7: Sales and Customer Service Occupations

Group 8: Process, Plant and Machine Operatives

Group 9: Elementary Occupations

Under this criterion, skilled trade should be classified within the middle class.

Use the SOC scheme at childhood and the NS-SEC at adulthood might create a concern in the reader, because these two classifications were based on very different criteria: skills versus employment relations. However, a study conducted by university of Essex reported that the continuity from SOC2000 to NS-SEC is about a 87% (ONS, 2010b; Rose & Pevalin 2010).

Discussion and conclusion:

Discussion:

Based on the literature review, and mainly on the UK occupational social class classifications guidelines (SOC and NS-SEC), it can be said that:

- Skilled trade occupations required some further education, experience and understanding of the work (definition point 1).
- The skilled trade category, might include manual and non-manual occupations (point 2).
- It seems that individuals classified within the "skilled trade" category may receive reasonable job security and income, and some of the individuals could have the combination of exercise authority and been also close monitored from above, which is compatible with the NS-SEC intermediate class classification (point 2.2).

- Moreover, the SOC2000 classification clearly mentioned that skilled trade classification is higher in the hierarchy than other unskilled-manual occupations (point 4).
- It is reasonable to affirm that skilled trade can be classified in the third level of SOC2010 (point 4).
- On the other hand, skilled trade seems to also lye within the labour contract. Which suggested that skilled trade belongs to the lower class (point 3.2).

This way of classifying paternal occupations suffers from limitations and it will never be perfect. Ideally, ELSA would have more information to classify paternal occupation more accurately, but the data did not allow a more precise classification and this may have somewhat influenced the results of this thesis, though I took measures to minimise any such influence.

Conclusion:

The official documents and occupations lists of NS-SEC and SOC suggested that there are arguments on two directions: suggesting that the skilled trade group contains individuals that could be classified either as low or middle class. However, more and stronger arguments were found supporting that the "skilled trade" category should be mapped within the intermediate class.

Additionally, the categories something else, unemployed and sick and disabled were classified into the low SEP group, this decision was based on how other researchers have previously classified paternal SEP (Demakakos et al. 2012; Vanhoutte & Nazroo 2016). Nevertheless, less than 1% of individuals were classified within these categories.

Appendix B. NS-SEC eight, five and three class-version scheme (ONS 2010b)

Figure 43 illustrates the three versions of the NS-SEC conceptual model according to the number of categories of classification: eight, five or three categories. Also, this table shows the nested relationships between these versions.

Figure 43. NS-SEC conceptual model, eight, five and three class version

Operational categories	Analytic class variables		
	Eight categories	**Five categories**	**Three categories**
L1 Employers in large establishments	1. Higher managerial and professional occupations	1. Higher managerial, administrative and professional occupations	1. Higher managerial, administrative and professional occupations
L2 Higher managerial occupations			
L3 Higher professional occupation			
L4 Lower professional and higher technical occupations	2. Lower managerial, administrative and professional occupations		
L5 Lower managerial occupations			
L6 Higher supervisory occupations			
L7 Intermediate occupations	3. Intermediate occupations	2. Intermediate occupations	2. Intermediate occupations
L8 Employers in small establishments	4. Small employers and own account workers	3. Small employers and own account workers	
L9 Own account workers			
L10 Lower supervisory occupations	5. Lower supervisory and technical occupations	4. Lower supervisory and technical occupations	3. Routine and manual occupations
L11 Lower technical occupations			
L12 Semi-routine occupations	6. Semi-routine occupations	5. Semi-routine occupations and routine occupations	
L13 Routine occupations	7. Routine occupations		
L14 Never worked and long-term unemployed	8. Never worked and long-term unemployed	*Never worked and long-term unemployed	*Never worked and long-term unemployed

Source: Office National Statistics (2017): web page.

Appendix C. Multiple imputation diagnosis

Wave 3

Figure 44 to Figure 48 display the trace plots for the predicted means value and standard deviation of childhood SEP, childhood self-rated general health and grip strength of wave 3 and wave 4 produced during the sixty imputations. These plots showed that the values vary randomly.

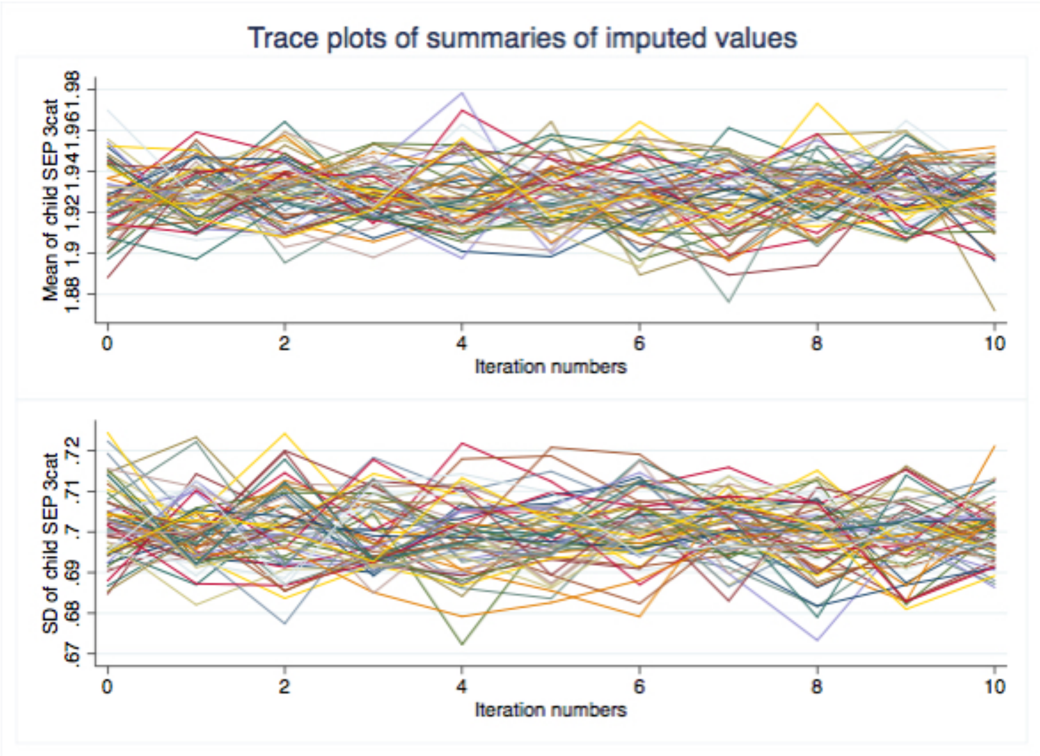

Figure 44. Wave 3 childhood SEP imputation trace plot

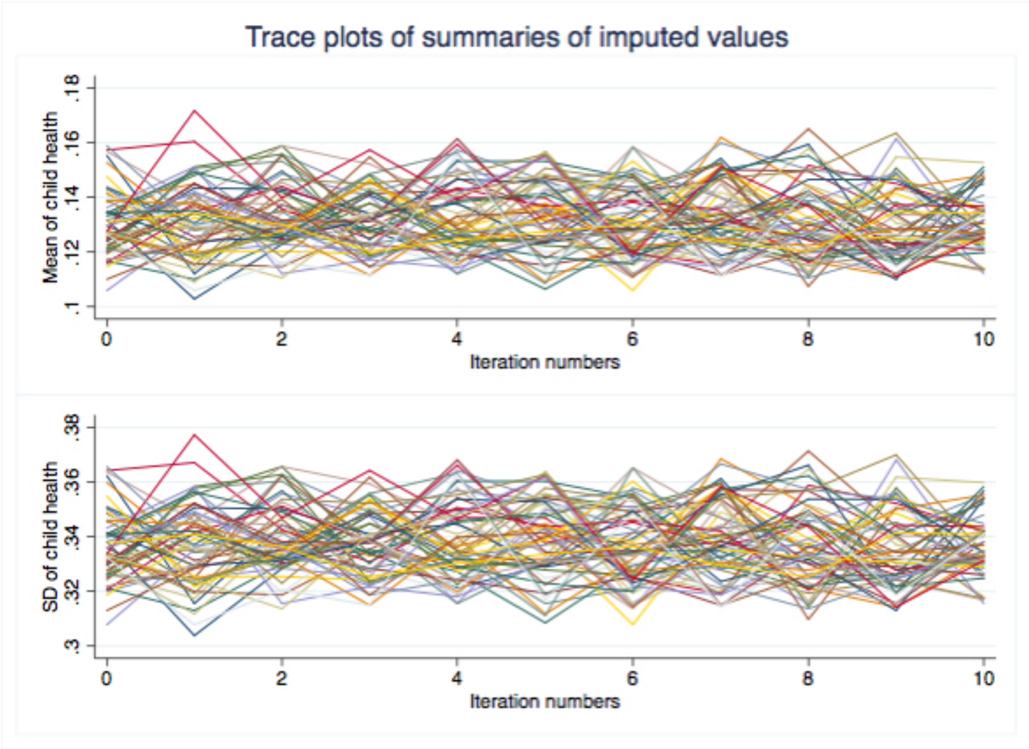

Figure 45. Wave 3 childhood self-rated general health imputation trace plot

Wave 4

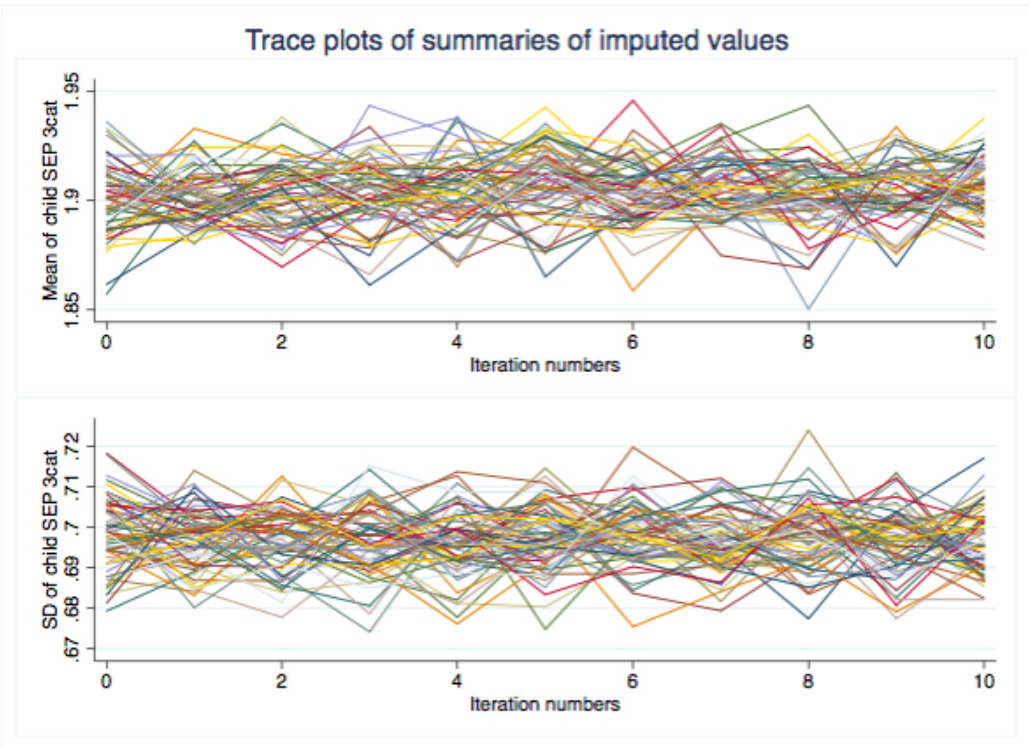

Figure 46. Wave 4 childhood SEP imputation trace plot

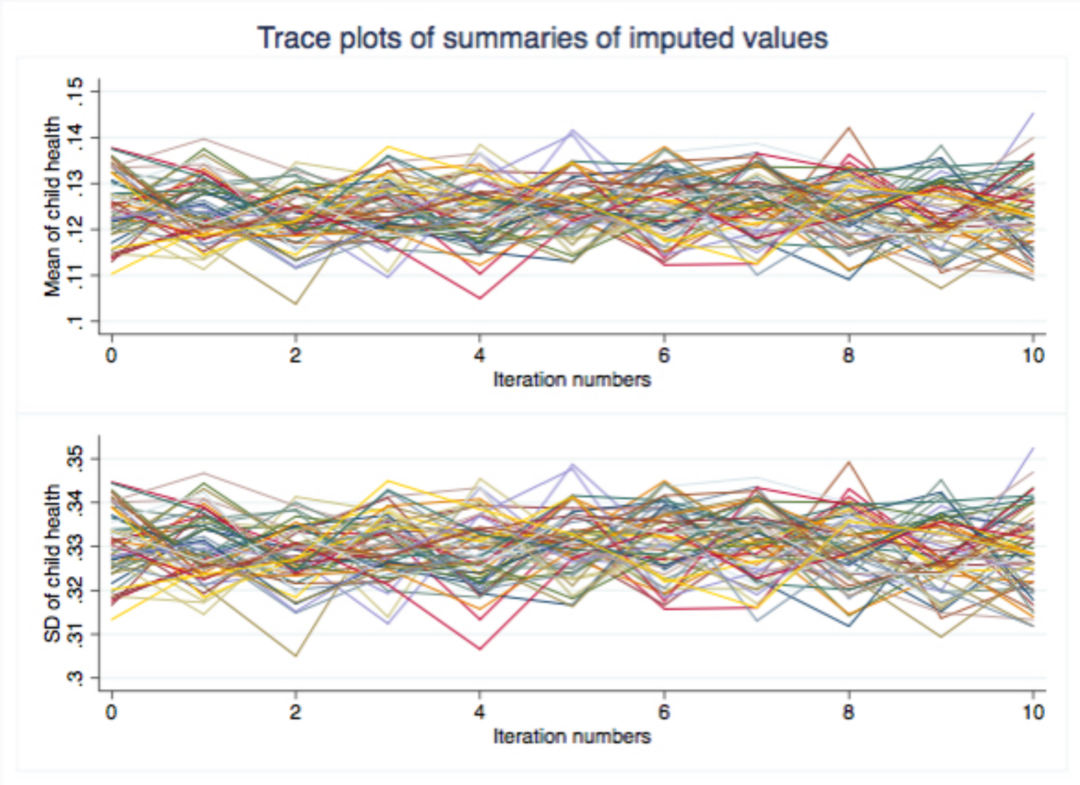

Figure 47. Wave 4 childhood self-rated general health imputation trace plot

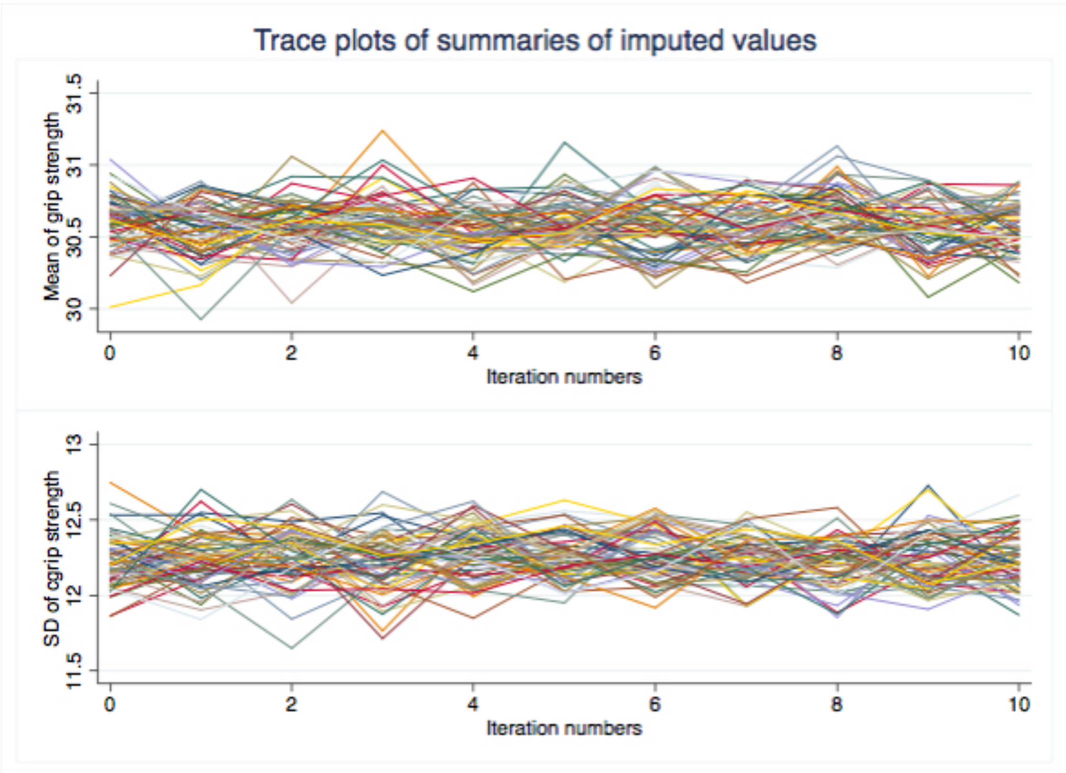

Figure 48. Wave 4 grip strength imputation trace plot

Appendix D. Max grip strength Kdensity and normality diagram

Figure 49 displays the distribution of maximum grip strength of the wave 4 analytical sample (imputed data). The blue line of this figure illustrates the distribution of grip strength and the red line illustrate a normal distribution, showing that the sample distribution was slightly positively skewed and had positive kurtosis. However, the sample distribution did not deviate considerably from a normal distribution.

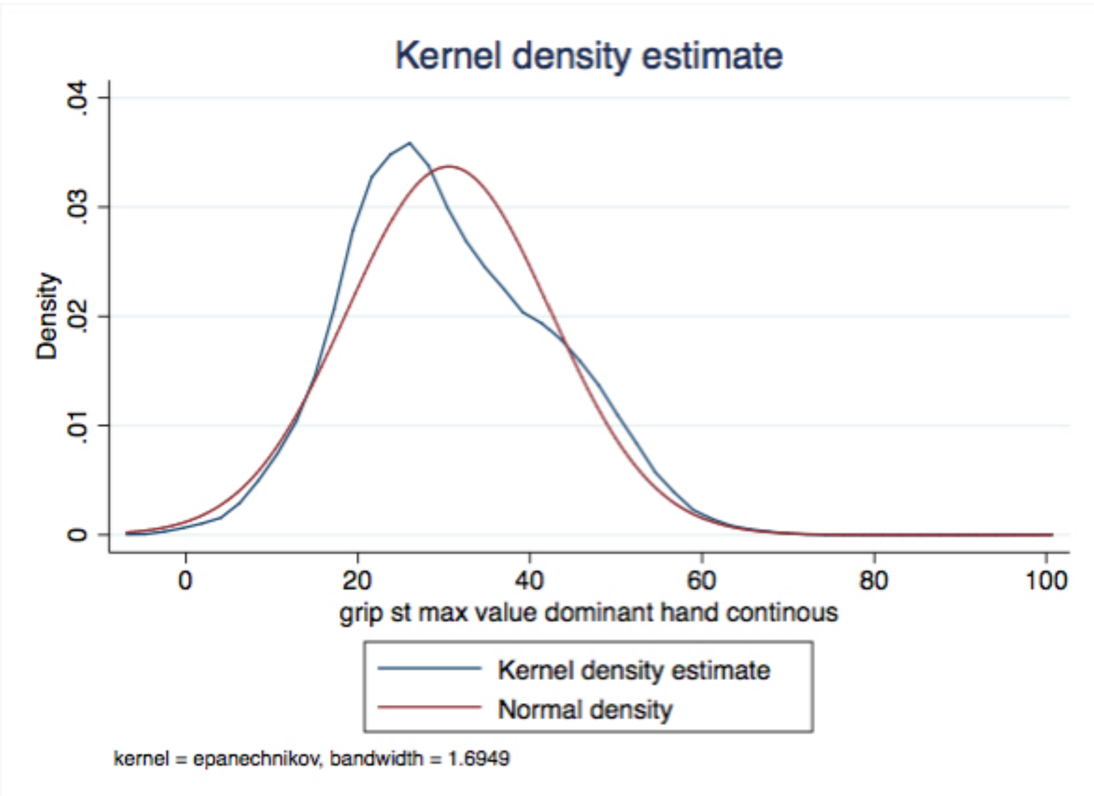

Figure 49. Maximum grip strength distribution compared to a normal distribution curve

Appendix E. Un-weighted descriptive statistics

Table 39 displays the unweighted distribution of respondents by socio-demographic characteristics of both analytical samples - wave 3 and wave 4 –. Table 40 presents the comparison by gender.

Table 39. Socio-demographic characteristics of analytic samples wave 3 and wave 4; unweighted (%)

	w3 n=8659	w4 n=9805
Gender		
Men	44.8	44.9
Women	55.2	55.1
Age group		
50 to 64	50.4	50.0
65 to 74	26.6	30.0
74+	23.0	20.1
Age continuous: Mean(SD)	66.0 (10.8)	66.2 (9.9)
Childhood SEP		
Managerial/ Professional (High)	31.6	33.0
Intermediate (Middle)	50.2	49.9
Routine/Manual (Low)	18.2	17.2
Adult SEP (household SEP)		
Managerial/ Professional (High)	42.2	44.6
Intermediate (Middle)	25.5	25.0
Routine/Manual (Low)	32.3	30.4
Self-rated Health		
Good health	67.2	
Poor health	32.8	
Self-rated Oral Health		
Good oral health	81.5	
Poor oral health	18.5	
Total tooth loss		
Dentate	82.8	
Edentate	17.2	
Oral Impacts		
No impact	93.7	
Impact	6.3	
Grip Strength: Mean(SD)		30.6 (12.5)
Education		
High degree or post-secondary qualif	39.3	41.4
Secondary qualification	30.5	30.4
No qualification	30.2	28.2
Employment status		
Employed	34.1	33.7
Retired	51.4	53.7
Other inactive	14.6	12.5
Marital Status		
Married	67.4	69.2
Single	5.2	5.5
Separated/Divorced	10.2	10.1
Widowed	17.1	15.3
Childhood self-rated health		
Good health	87.7	87.7
Poor health	12.3	12.3

Un-weighted percentages of imputed data.

Table 40. Analytic sample socio-demographic characteristics and outcomes distributions by gender; unweighted (%)

	w3 n=8659		w4=9805	
	Men n=3877	Women n= 4782	Men n=4398	Women n=5407
Age group				
50 to 64	51.3	49.6	50.1	49.8
65 to 74	27.5	25.8	31.1	29.1
74+	21.2	24.5	18.8	21.1
Age continuous: Mean(SD)	65.6 (15.6)	66.3 (14.8)	65.9 (14.3)	66.4 (13.8)
Childhood SEP				
High	29.9	32.9	31.9	33.9
Middle	51.6	49.2	51.2	48.8
Low	18.5	17.9	16.9	17.4
Adult SEP (household SEP)				
High	46.2	39.0	48.4	41.5
Middle	24.1	26.6	23.8	26.0
Low	29.7	34.5	27.8	32.5
Self-rated health				
Good	67.5	66.9		
Poor	32.5	33.1		
Self-rated oral health				
Good	80.1	82.7		
Poor	19.9	17.3		
Edentulousness				
Dentate	85.1	80.9		
Edentate	14.9	19.1		
Oral impacts				
No impact	93.6	93.8		
Impact	6.4	6.2		
Grip Strength: Mean(SD)			39.5 (10.6)	23.3 (8.36)
Education				
High degree	48.2	32.1	50.2	34.2
Secondary qualification	28.0	32.6	27.2	33.0
No qualification	23.8	35.3	22.6	32.8
Employment status				
Employed	39.3	29.8	39.4	29.1
Retired	52.4	50.5	52.6	54.7
Other inactive	8.3	19.7	8.0	16.2
Marital Status				
Married	77.2	59.5	77.6	62.3
Single	5.7	4.9	6.3	4.8
Separated/Divorced	8.2	11.9	8.0	11.8
Widowed	9.0	23.7	8.0	21.1
Childhood self-rated health				
Good health	88.5	87.0	88.5	87.1
Poor health	11.5	13.0	11.5	12.9

Un-weighted percentages of imputed data

Table 41 describes wave 3 and wave 4 unweighted social mobility trajectories distribution.

Table 42 shows the social mobility distributions stratified by gender.

Table 41. Social mobility trajectories distributions; unweighted (%)

	w3 n=8659	w4 n=9805
Social Trajectories		
Stable High	18.0	19.2
Stable Middle	13.5	13.2
Stable Low	9.5	8.5
Total stable	**41.0**	**40.9**
Upward Middle to High	19.8	20.6
Upward Low to High	4.4	4.7
Upward Low to Middle	4.2	4.0
Total upwardly mobile	**28.4**	**29.3**
Downward Middle to Low	16.9	16.0
Downward High to Middle	7.7	7.8
Downward High to Low	5.9	5.9
Total downwardly mobile	**30.5**	**29.7**

Un-weighted percentages of imputed data

Table 42. Social mobility trajectories distributions by gender; unweighted (%)

	wave 3		wave 4	
	Men n=3877	Women n=4782	Men n=4398	Women n=5407
Social Trajectories				
Upward Mid-High	22.8	17.4	23.4	18.4
Upward Low-High	4.8	4.1	5.0	4.5
Upward Low-Mid	4.4	4.1	3.9	4.0
Total Upward	**32.0**	**25.6**	**32.3**	**26.9**
Downward Mid-Low	15.8	17.8	14.9	16.8
Downward High-Mid	6.7	8.5	7.1	8.4
Downward High-Low	4.6	7.0	4.8	6.9
Total Downward	**27.1**	**33.3**	**26.8**	**32.1**
Stable High	18.7	17.4	20.0	18.6
Stable Middle	13.0	14.0	12.8	13.6
Stable Low	9.3	9.6	8.1	8.8
Total stable	**41.0**	**41.0**	**40.9**	**41.0**

Un-weighted percentages of imputed data

Appendix F. Regression analysis: complete tables

Table 43 to Table 57 show the results of logistic and linear regression models used to test the association between general health, oral health and physical function and intergenerational social mobility trajectories, with the sequential inclusion of covariates one by one.

Table 43. Logistic regression models between self-rated general health and social trajectories sequentially adjusted for covariates OR (95%CI)
Imputed data analysis; w3 n=8659; poor self-rated general health: 33.6%

	Model 1 SRH +Social trajectories (Unadjusted model)		Model 1+gender		Model 1+gender+age	
Social Trajectories						
Stable High	1		1		1	
Up Mid-High	1.23	(1.02, 1.49)*	1.23	(1.02, 1.49)*	1.20	(1.00, 1.45)
Up Low-High	1.56	(1.17, 2.10)*	1.56	(1.17, 2.10)*	1.54	(1.15, 2.06)*
Down High-Mid	1.44	(1.13, 1.84)*	1.44	(1.13, 1.84)*	1.33	(1.04, 1.70)*
Stable Middle	1.70	(1.40, 2.06)**	1.70	(1.40, 2.06)**	1.61	(1.33, 1.96)**
Up Low-Mid	2.18	(1.63, 2.92)**	2.18	(1.63, 2.92)**	2.14	(1.59, 2.87)**
Down High-Low	2.72	(2.11, 3.49)**	2.72	(2.12, 3.50)**	2.54	(1.97, 3.28)**
Down Mid-Low	3.17	(2.65, 3.78)**	3.17	(2.65, 3.78)**	2.89	(2.42, 3.45)**
Stable Low	4.48	(3.65, 5.50)**	4.48	(3.65, 5.50)**	4.13	(3.36, 5.07)**
Gender						
Men			1		1	
Women			0.99	(0.90, 1.09)	0.95	(0.86, 1.04)
Age						
Continuous					1.03	(1.02, 1.03)**
Education						
High degree						
Secondary qualif						
No qualification						
Smoking						
Never smoker						
Ex-smoker						
Smoker						
Physical activity						
Active						
Non-active						
Employment status						
Employed						
Retired						
Other inactive						
Marital status						
Married						
Single						
Separated						
Widowed						
Childhood Health						
Good						
Poor						

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001*

Table 44. Logistic regression models between self-rated general health and social trajectories sequentially adjusted for covariates OR (95%CI)
Imputed data analysis; w3 n=8659; poor self-rated general health: 33.6%

	Model 1+gender+age +education		Model 1+gender+age +education +smoking		Model 1+gender+age +education +smoking +physical activity	
Social Trajectories						
Stable High	1		1		1	
Up Mid-High	1.11	(0.92, 1.34)	1.11	(0.92, 1.34)	1.09	(0.90, 1.32)
Up Low-High	1.34	(1.00, 1.79)*	1.33	(0.99, 1.78)	1.32	(0.98, 1.78)
Down High-Mid	1.15	(0.89, 1.47)	1.13	(0.88, 1.45)	1.08	(0.84, 1.40)
Stable Middle	1.30	(1.06, 1.59)*	1.27	(1.04, 1.56)*	1.23	(1.00, 1.51)*
Up Low-Mid	1.64	(1.22, 2.22)*	1.59	(1.17, 2.15)*	1.57	(1.16, 2.13)*
Down High-Low	1.94	(1.50, 2.52)**	1.88	(1.45, 2.44)**	1.76	(1.33, 2.29)**
Down Mid-Low	2.10	(1.73, 2.54)**	2.00	(1.65, 2.42)**	1.93	(1.59, 2.36)**
Stable Low	2.84	(2.27, 3.55)**	2.66	(2.12, 3.32)**	2.62	(2.08, 3.28)**
Gender						
Men	1		1		1	
Women	0.88	(0.79, 0.97)*	0.91	(0.82, 1.01)	0.99	(0.89, 1.10)
Age						
Continuous	1.02	(1.02, 1.03)**	1.03	(1.02, 1.03)**	1.02	(1.01, 1.02)**
Education						
High degree	1		1		1	
Secondary qualif	1.38	(1.21, 1.57)**	1.35	(1.19, 1.54)**	1.35	(1.18, 1.54)**
No qualification	1.94	(1.69, 2.24)**	1.87	(1.62, 2.15)**	1.79	(1.55, 2.06)**
Smoking						
Never smoker			1		1	
Ex-smoker			1.21	(1.08, 1.35)*	1.20	(1.07, 1.34)*
Smoker			1.86	(1.60, 2.16)**	1.78	(1.54, 2.07)**
Physical activity						
Active					1	
Non-active					3.05	(2.61, 3.55)**
Employment status						
Employed						
Retired						
Other inactive						
Marital status						
Married						
Single						
Separated						
Widowed						
Childhood Health						
Good						
Poor						

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001*

Table 45. Logistic regression models between self-rated general health and social trajectories sequentially adjusted for covariates OR (95%CI)
Imputed data analysis; w3 n=8659; poor self-rated general health: 33.6%

	Model 1 +gender+ age+educ +smoking +physical activity+ employment st		Model 1+gender+age +educ+smoking +phys act +employment +marital st		Model 1+gender+age +educ +smoking +physical act+ employment +marital st +child health (Fully adjusted model)	
Social Trajectories						
Stable High	1		1		1	
Up Mid-High	1.09	(0.90, 1.32)	1.09	(0.90, 1.32)	1.09	(0.90, 1.32)
Up Low-High	1.34	(0.99, 1.82)	1.33	(0.98, 1.80)	1.31	(0.97, 1.78)
Down High-Mid	1.11	(0.86, 1.44)	1.07	(0.83, 1.39)	1.06	(0.81, 1.38)
Stable Middle	1.25	(1.01, 1.53)*	1.22	(0.99, 1.50)	1.21	(0.98, 1.49)
Up Low-Mid	1.57	(1.15, 2.16)*	1.53	(1.12, 2.10)*	1.52	(1.10, 2.09)*
Down High-Low	1.62	(1.24, 2.12)**	1.51	(1.15, 1.98)*	1.50	(1.14, 1.97)*
Down Mid-Low	1.86	(1.53, 2.28)**	1.75	(1.43, 2.14)**	1.71	(1.40, 2.09)**
Stable Low	2.49	(1.98, 3.14)**	2.33	(1.84, 2.94)**	2.30	(1.82, 2.91)**
Gender						
Men	1		1		1	
Women	0.86	(0.78, 0.96)*	0.84	(0.75, 0.94)*	0.83	(0.75, 0.93)*
Age						
Continuous	1.00	(1.00, 1.01)	1.00	(1.00, 1.01)	1.00	(1.00, 1.01)
Education						
High degree	1		1		1	
Secondary qualif	1.28	(1.12, 1.46)**	1.30	(1.14 1.49)**	1.31	(1.14, 1.50)**
No qualification	1.61	(1.39, 1.86)**	1.65	(1.43, 1.91)**	1.68	(1.45, 1.95)**
Smoking						
Never smoker	1		1		1	
Ex-smoker	1.20	(1.07, 1.35)*	1.21	(1.07, 1.35)*	1.21	(1.08, 1.36)*
Smoker	1.70	(1.46, 1.99)**	1.62	(1.38, 1.89)**	1.65	(1.41, 1.93)**
Physical activity						
Active	1		1		1	
Non-active	2.82	(2.42, 3.29)**	2.82	(2.42, 3.28)**	2.79	(2.39, 3.26)**
Employment status						
Employed	1		1		1	
Retired	2.35	(2.01, 2.74)**	2.33	(1.99, 2.71)**	2.30	(1.97, 2.68)**
Other inactive	4.38	(3.71, 5.17)**	4.37	(3.70, 5.17)**	4.20	(3.55, 4.97)**
Marital status						
Married			1		1	
Single			1.35	(1.07, 1.69)*	1.30	(1.03, 1.63)*
Separated			1.57	(1.33, 1.86)**	1.58	(1.34, 1.87)**
Widowed			1.14	(0.97, 1.33)	1.14	(0.98, 1.34)
Childhood Health						
Good					1	
Poor					2.08	(1.76, 2.45)**

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001*

Table 46. Logistic regression models between self-rated oral health and social trajectories sequentially adjusted for covariates OR (95%CI)

Imputed data analysis; w3 n=8659; poor self-rated oral health (SRoH): 19.1%

	Model 1 SRoH +Social trajectories (Unadjusted model)		Model 1+gender		Model 1+gender+age	
Social Trajectories						
Stable High	1		1		1	
Up Mid-High	0.86	(0.69, 1.07)	0.85	(0.68, 1.06)	0.86	(0.69, 1.06)
Up Low-High	0.87	(0.61, 1.24)	0.87	(0.61, 1.24)	0.87	(0.61, 1.24)
Down High-Mid	1.07	(0.81, 1.41)	1.09	(0.82, 1.43)	1.11	(0.84, 1.46)
Stable Middle	1.10	(0.89, 1.38)	1.11	(0.89, 1.39)	1.13	(0.91, 1.41)
Up Low-Mid	1.23	(0.88, 1.71)	1.23	(0.88, 1.71)	1.24	(0.89, 1.73)
Down High-Low	1.38	(1.02, 1.87)*	1.42	(1.04, 1.92)*	1.45	(1.06, 1.97)*
Down Mid-Low	1.50	(1.23, 1.83)**	1.51	(1.24, 1.85)**	1.56	(1.27, 1.91)**
Stable Low	1.51	(1.19, 1.91)*	1.52	(1.20, 1.92)*	1.56	(1.23, 1.98)**
Gender						
Men			1		1	
Women			0.80	(0.72, 0.90)**	0.81	(0.73, 0.91)**
Age						
Continuous					0.99	(0.99, 1.00)*
Education						
High degree						
Secondary qualif						
No qualification						
Smoking						
Never smoker						
Ex-smoker						
Smoker						
Physical activity						
Active						
Non-active						
Employment status						
Employed						
Retired						
Other inactive						
Marital status						
Married						
Single						
Separated						
Widowed						
Childhood Health						
Good						
Poor						

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001*

Table 47. Logistic regression models between self-rated oral health and social trajectories sequentially adjusted for covariates OR (95%CI)

Imputed data analysis; w3 n=8659; poor self-rated oral health (SRoH): 19.1%

	Model 1+gender+age +education		Model 1+gender+age +education +smoking		Model 1+gender+age +education +smoking +physical activity	
Social Trajectories						
Stable High	1		1		1	
Up Mid-High	0.83	(0.66, 1.03)	0.82	(0.66, 1.02)	0.81	(0.65, 1.00)
Up Low-High	0.82	(0.57, 1.16)	0.81	(0.57, 1.15)	0.80	(0.56, 1.14)
Down High-Mid	1.04	(0.79, 1.38)	1.02	(0.77, 1.35)	1.00	(0.76, 1.31)
Stable Middle	1.02	(0.81, 1.29)	1.00	(0.79, 1.26)	0.97	(0.77, 1.23)
Up Low-Mid	1.09	(0.78, 1.53)	1.04	(0.74, 1.45)	1.02	(0.73, 1.44)
Down High-Low	1.25	(0.91, 1.72)	1.20	(0.88, 1.65)	1.14	(0.83, 1.56)
Down Mid-Low	1.31	(1.06, 1.64)*	1.23	(0.99, 1.54)	1.19	(0.96, 1.49)
Stable Low	1.26	(0.98, 1.63)	1.16	(0.89, 1.50)	1.12	(0.86, 1.45)
Gender						
Men	1		1		1	
Women	0.78	(0.70, 0.88)**	0.81	(0.72, 0.91)**	0.86	(0.76, 0.97)*
Age						
Continuous	0.99	(0.98, 1.00)**	0.99	(0.99, 1.00)*	0.99	(0.98, 0.99)**
Education						
High degree	1		1		1	
Secondary qualif	1.05	(0.91, 1.22)	1.03	(0.88, 1.19)	1.02	(0.88, 1.18)
No qualification	1.46	(1.24, 1.73)**	1.39	(1.18, 1.65)**	1.34	(1.13, 1.58)*
Smoking						
Never smoker			1		1	
Ex-smoker			1.27	(1.11, 1.45)**	1.26	(1.11, 1.44)*
Smoker			1.96	(1.66, 2.31)**	1.90	(1.61, 2.24)**
Physical activity						
Active					1	
Non-active					2.04	(1.74, 2.39)**
Employment status						
Employed						
Retired						
Other inactive						
Marital status						
Married						
Single						
Separated						
Widowed						
Childhood Health						
Good						
Poor						

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001*

Table 48. Logistic regression models between self-rated oral health and social trajectories sequentially adjusted for covariates OR (95%CI)
Imputed data analysis; w3 n=8659; poor self-rated oral health (SRoH): 19.1%

	Model 1 +gender+age+educ +smoking +physical act+ employment st		Model 1+gender+age +educ+smoking +phys act +employment+marital st		Model 1+gender+age +educ +smoking +physical act+ employment +marital st +child health (Fully adjusted model)	
Social Trajectories						
Stable High	1		1		1	
Up Mid-High	0.81	(0.65, 1.01)	0.81	(0.65, 1.01)	0.81	(0.65, 1.01)
Up Low-High	0.81	(0.56, 1.15)	0.79	(0.55, 1.13)	0.78	(0.55, 1.12)
Down High-Mid	0.99	(0.75, 1.30)	0.94	(0.71, 1.24)	0.93	(0.71, 1.23)
Stable Middle	0.97	(0.77, 1.22)	0.94	(0.74, 1.19)	0.93	(0.74, 1.18)
Up Low-Mid	1.02	(0.72, 1.43)	0.98	(0.70, 1.37)	0.97	(0.69, 1.36)
Down High-Low	1.11	(0.81, 1.52)	1.00	(0.73, 1.39)	1.00	(0.72, 1.38)
Down Mid-Low	1.18	(0.94, 1.47)	1.08	(0.86, 1.35)	1.06	(0.85, 1.33)
Stable Low	1.10	(0.84, 1.42)	1.00	(0.77, 1.30)	0.99	(0.76, 1.29)
Gender						
Men	1		1		1	
Women	0.83	(0.74, 0.94)*	0.81	(0.71, 0.91)*	0.80	(0.71, 0.91)*
Age						
Continuous	0.99	(0.98, 1.00)*	0.99	(0.98, 1.00)	0.99	(0.98, 1.00)*
Education						
High degree	1		1		1	
Secondary qualif	1.01	(0.87, 1.17)	1.03	(0.88, 1.19)	1.03	(0.88, 1.19)
No qualification	1.31	(1.11, 1.55)*	1.35	(1.14, 1.60)**	1.36	(1.15, 1.61)*
Smoking						
Never smoker	1		1		1	
Ex-smoker	1.27	(1.11, 1.45)**	1.27	(1.11, 1.45)**	1.27	(1.11, 1.45)**
Smoker	1.88	(1.59, 2.22)**	1.75	(1.48, 2.07)**	1.76	(1.49, 2.09)**
Physical activity						
Active	1		1		1	
Non-active	1.95	(1.67, 2.29)**	1.95	(1.66, 2.29)**	1.93	(1.64, 2.27)**
Employment status						
Employed	1		1		1	
Retired	0.91	(0.77, 1.08)	0.89	(0.75, 1.05)	0.88	(0.74, 1.04)
Other inactive	1.32	(1.10, 1.58)*	1.29	(1.07, 1.54)*	1.25	(1.04, 1.50)*
Marital status						
Married			1		1	
Single			1.41	(1.10, 1.80)*	1.38	(1.08, 1.77)*
Separated			1.85	(1.56, 2.20)**	1.85	(1.56, 2.21)**
Widowed			1.12	(0.93, 1.34)	1.12	(0.93, 1.34)
Childhood Health						
Good					1	
Poor					1.45	(1.21, 1.73)**

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001*

Table 49. Logistic regression models between total tooth loss and social trajectories sequentially adjusted for covariates OR (95%CI)

Imputed data analysis; w3 n=8659; Total tooth loss (TTL): 17.9%

	Model 1 TTL +Social trajectories (Unadjusted model)		Model 1+gender		Model 1+gender+age	
Social Trajectories						
Stable High	1		1		1	
Up Mid-High	1.40	(1.06, 1.86)*	1.43	(1.08, 1.89)*	1.37	(1.03, 1.82)*
Up Low-High	2.51	(1.72, 3.66)**	2.54	(1.74, 3.71)**	2.66	(1.79, 3.96)**
Down High-Mid	1.76	(1.24, 2.48)*	1.72	(1.22, 2.43)*	1.29	(0.89, 1.88)
Stable Middle	2.23	(1.69, 2.95)**	2.22	(1.68, 2.92)**	2.02	(1.51, 2.68)**
Up Low-Mid	3.06	(2.10, 4.44)**	3.08	(2.11, 4.47)**	3.26	(2.20, 4.85)**
Down High-Low	3.48	(2.51, 4.84)**	3.36	(2.42, 4.67)**	2.96	(2.08, 4.21)**
Down Mid-Low	4.86	(3.78, 6.24)**	4.81	(3.75, 6.18)**	4.18	(3.23, 5.39)**
Stable Low	6.57	(5.02, 8.60)**	6.57	(5.01, 8.60)**	6.01	(4.54, 7.96)**
Gender						
Men			1		1	
Women			1.39	(1.23, 1.57)**	1.23	(1.08, 1.40)*
Age						
Continuous					1.09	(1.08, 1.10)**
Education						
High degree						
Secondary qualif						
No qualification						
Smoking						
Never smoker						
Ex-smoker						
Smoker						
Physical activity						
Active						
Non-active						
Employment status						
Employed						
Retired						
Other inactive						
Marital status						
Married						
Single						
Separated						
Widowed						
Childhood Health						
Good						
Poor						

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001*

Table 50. Logistic regression models between total tooth loss and social trajectories sequentially adjusted for covariates OR (95%CI)

Imputed data analysis; w3 n=8659; Total tooth loss (TTL): 17.9%

	Model 1+gender+age +education		Model 1+gender+age +education +smoking		Model 1+gender+age +education +smoking +physical activity	
Social Trajectories						
Stable High	1		1		1	
Up Mid-High	1.24	(0.93, 1.66)	1.23	(0.92, 1.66)	1.24	(0.92, 1.66)
Up Low-High	2.25	(1.50, 3.36)**	2.26	(1.50, 3.40)**	2.27	(1.51, 3.42)**
Down High-Mid	1.10	(0.75, 1.59)	1.07	(0.73, 1.57)	1.06	(0.72, 1.56)
Stable Middle	1.56	(1.16, 2.11)*	1.54	(1.14, 2.08)*	1.53	(1.13, 2.08)*
Up Low-Mid	2.42	(1.61, 3.64)**	2.34	(1.55, 3.54)**	2.34	(1.55, 3.54)**
Down High-Low	2.16	(1.50, 3.11)**	2.09	(1.44, 3.02)**	2.07	(1.43, 2.99)**
Down Mid-Low	2.88	(2.18, 3.79)**	2.68	(2.02, 3.54)**	2.66	(2.01, 3.53)**
Stable Low	3.88	(2.85, 5.27)**	3.51	(2.57, 4.80)**	3.50	(2.56, 4.79)**
Gender						
Men	1		1		1	
Women	1.14	(0.99, 1.30)	1.25	(1.09, 1.44)*	1.28	(1.12, 1.47)**
Age						
Continuous	1.08	(1.08, 1.09)**	1.09	(1.09, 1.10)**	1.09	(1.08, 1.10)**
Education						
High degree	1		1		1	
Secondary qualif	1.30	(1.07, 1.56)*	1.25	(1.03, 1.51)*	1.24	(1.03, 1.50)*
No qualification	2.11	(1.74, 2.55)**	1.98	(1.63, 2.40)**	1.95	(1.61, 2.36)**
Smoking						
Never smoker			1		1	
Ex-smoker			1.59	(1.37, 1.86)**	1.58	(1.36, 1.85)**
Smoker			3.39	(2.79, 4.13)**	3.34	(2.74, 4.06)**
Physical activity						
Active					1	
Non-active					1.33	(1.11, 1.60)*
Employment status						
Employed						
Retired						
Other inactive						
Marital status						
Married						
Single						
Separated						
Widowed						
Childhood Health						
Good						
Poor						

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001*

Table 51. Logistic regression models between total tooth loss and social trajectories sequentially adjusted for covariates OR (95%CI)
Imputed data analysis; w3 n=8659; Total tooth loss (TTL): 17.9%

	Model 1 +gender+age+educ +smoking +physical act +employment st		Model 1+gender+age +educ+smoking +phys act +employment+marital st		Model 1+gender+age +educ +smoking +physical act+ employment +marital st +child health (Fully adjusted model)	
Social Trajectories						
Stable High	1		1		1	
Up Mid-High	1.23	(0.91, 1.65)	1.23	(0.92, 1.66)	1.23	(0.92, 1.66)
Up Low-High	2.24	(1.49, 3.38)**	2.24	(1.48, 3.37)**	2.23	(1.48, 3.36)**
Down High-Mid	1.07	(0.73, 1.58)	1.05	(0.71, 1.55)	1.05	(0.71, 1.55)
Stable Middle	1.53	(1.13, 2.07)*	1.51	(1.12, 2.05)*	1.51	(1.11, 2.04)*
Up Low-Mid	2.33	(1.54, 3.53)**	2.31	(1.53, 3.50)**	2.30	(1.52, 3.48)**
Down High-Low	2.04	(1.41, 2.95)**	1.97	(1.36, 2.86)**	1.96	(1.35, 2.85)**
Down Mid-Low	2.63	(1.99, 3.49)**	2.57	(1.93, 3.41)**	2.55	(1.92, 3.39)**
Stable Low	3.46	(2.53, 4.74)**	3.37	(2.45, 4.62)**	3.35	(2.44, 4.60)**
Gender						
Men	1		1		1	
Women	1.27	(1.11, 1.47)*	1.24	(1.08, 1.43)*	1.24	(1.07, 1.43)*
Age						
Continuous	1.08	(1.08, 1.09)**	1.08	(1.07, 1.09)**	1.08	(1.07, 1.09)**
Education						
High degree	1		1		1	
Secondary qualif	1.23	(1.02, 1.49)*	1.24	(1.02, 1.50)*	1.24	(1.02, 1.50)*
No qualification	1.91	(1.57, 2.32)**	1.91	(1.58, 2.33)**	1.92	(1.58, 2.34)**
Smoking						
Never smoker	1		1		1	
Ex-smoker	1.57	(1.35, 1.84)**	1.58	(1.35, 1.84)**	1.58	(1.36, 1.84)**
Smoker	3.31	(2.72, 4.03)**	3.29	(2.70, 4.01)**	3.31	(2.71, 4.04)**
Physical activity						
Active	1		1		1	
Non-active	1.33	(1.11, 1.59)*	1.33	(1.11, 1.59)*	1.32	(1.10, 1.58)*
Employment status						
Employed	1		1		1	
Retired	1.34	(1.07, 1.68)*	1.35	(1.07, 1.69)*	1.34	(1.07, 1.68)*
Other inactive	1.32	(1.02, 1.70)*	1.32	(1.03, 1.71)*	1.31	(1.01, 1.69)*
Marital status						
Married			1		1	
Single			1.04	(0.77, 1.42)	1.03	(0.76, 1.41)
Separated			1.03	(0.82, 1.30)	1.03	(0.82, 1.30)
Widowed			1.15	(0.97, 1.37)	1.15	(0.97, 1.37)
Childhood Health						
Good					1	
Poor					1.22	(0.98, 1.51)

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001*

Table 52. Logistic regression models between oral impacts on daily performance and social trajectories sequentially adjusted for covariates OR (95%CI)

Imputed data analysis; w3 n=8659; At least one oral impact on daily performance (OIDP): 6.4%

	Model 1 OIDP +Social trajectories (Unadjusted model)		Model 1+gender		Model 1+gender+age	
Social Trajectories						
Stable High	1		1		1	
Up Mid-High	0.96	(0.68, 1.36)	0.96	(0.68, 1.36)	0.94	(0.66, 1.33)
Up Low-High	1.23	(0.71, 2.13)	1.23	(0.71, 2.12)	1.21	(0.70, 2.09)
Down High-Mid	1.27	(0.80, 1.99)	1.27	(0.81, 2.00)	1.20	(0.76, 1.89)
Stable Middle	1.18	(0.81, 1.71)	1.18	(0.81, 1.71)	1.13	(0.78, 1.65)
Up Low-Mid	1.25	(0.72, 2.17)	1.25	(0.72, 2.17)	1.23	(0.71, 2.13)
Down High-Low	1.52	(0.93, 2.47)	1.53	(0.94, 2.50)	1.45	(0.89, 2.37)
Down Mid-Low	1.59	(1.14, 2.22)*	1.60	(1.15, 2.23)*	1.49	(1.06, 2.08)*
Stable Low	1.60	(1.09, 2.34)*	1.60	(1.09, 2.34)*	1.49	(1.01, 2.19)*
Gender						
Men			1		1	
Women			0.96	(0.80, 1.16)	0.93	(0.78, 1.12)
Age						
Continuous					1.02	(1.01, 1.03)**
Education						
High degree						
Secondary qualif						
No qualification						
Smoking						
Never smoker						
Ex-smoker						
Smoker						
Physical activity						
Active						
Non-active						
Employment status						
Employed						
Retired						
Other inactive						
Marital status						
Married						
Single						
Separated						
Widowed						
Childhood Health						
Good						
Poor						

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001*

Table 53. Logistic regression models between oral impacts on daily performance and social trajectories sequentially adjusted for covariates OR (95%CI)
Imputed data analysis; w3 n=8659; At least one oral impact on daily performance (OIDP): 6.4%

	Model 1+gender+age +education		Model 1+gender+age +education +smoking		Model 1+gender+age +education +smoking +physical activity	
Social Trajectories						
Stable High	1		1		1	
Up Mid-High	0.94	(0.67, 1.33)	0.93	(0.66, 1.32)	0.93	(0.65, 1.31)
Up Low-High	1.20	(0.69, 2.08)	1.19	(0.68, 2.06)	1.18	(0.68, 2.06)
Down High-Mid	1.23	(0.78, 1.94)	1.20	(0.76, 1.90)	1.17	(0.74, 1.85)
Stable Middle	1.14	(0.78, 1.68)	1.11	(0.76, 1.63)	1.09	(0.74, 1.59)
Up Low-Mid	1.22	(0.70, 2.14)	1.16	(0.66, 2.04)	1.15	(0.66, 2.01)
Down High-Low	1.42	(0.86, 2.36)	1.36	(0.82, 2.25)	1.29	(0.78, 2.13)
Down Mid-Low	1.45	(1.00, 2.10)	1.35	(0.93, 1.95)	1.30	(0.90, 1.86)
Stable Low	1.41	(0.92, 2.15)	1.28	(0.84, 1.96)	1.25	(0.81, 1.91)
Gender						
Men	1		1		1	
Women	0.92	(0.77, 1.11)	0.96	(0.79, 1.15)	1.02	(0.84, 1.23)
Age						
Continuous	1.02	(1.01, 1.03)**	1.02	(1.01, 1.03)**	1.01	(1.01, 1.02)*
Education						
High degree	1		1		1	
Secondary qualif	0.83	(0.64, 1.06)	0.81	(0.63, 1.03)	0.80	(0.62, 1.02)
No qualification	1.10	(0.84, 1.45)	1.05	(0.80, 1.38)	1.01	(0.76, 1.33)
Smoking						
Never smoker			1		1	
Ex-smoker			1.21	(0.97, 1.51)**	1.20	(0.96, 1.49)
Smoker			1.99	(1.53, 2.60)**	1.91	(1.47, 2.49)**
Physical activity						
Active					1	
Non-active					2.01	(1.57, 2.57)**
Employment status						
Employed						
Retired						
Other inactive						
Marital status						
Married						
Single						
Separated						
Widowed						
Childhood Health						
Good						
Poor						

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001*

Table 54. Logistic regression models between oral impacts on daily performance and social trajectories sequentially adjusted for covariates OR (95%CI)
Imputed data analysis; w3 n=8659; At least one oral impact on daily performance (OIDP): 6.4%

	Model 1 +gender+age+educ +smoking +physical activity+ employment st		Model 1+gender+age +educ+smoking +phys act +employment+marital st		Model 1+gender+age +educ +smoking +physical act+ employment +marital st +child health (Fully adjusted model)	
Social Trajectories						
Stable High	1		1		1	
Up Mid-High	0.92	(0.65, 1.31)	0.92	(0.65, 1.30)	0.92	(0.65, 1.30)
Up Low-High	1.19	(0.66, 2.07)	1.16	(0.66, 2.04)	1.15	(0.66, 2.02)
Down High-Mid	1.18	(0.74, 1.86)	1.13	(0.71, 1.79)	1.12	(0.71, 1.78)
Stable Middle	1.08	(0.74, 1.59)	1.05	(0.72, 1.54)	1.05	(0.71, 1.53)
Up Low-Mid	1.13	(0.64, 1.98)	1.09	(0.62, 1.91)	1.07	(0.61, 1.89)
Down High-Low	1.21	(0.73, 2.01)	1.12	(0.68, 1.87)	1.11	(0.67, 1.85)
Down Mid-Low	1.26	(0.87, 1.82)	1.18	(0.81, 1.71)	1.16	(0.80, 1.68)
Stable Low	1.19	(0.78, 1.83)	1.11	(0.72, 1.71)	1.10	(0.72, 1.69)
Gender						
Men	1		1		1	
Women	0.95	(0.79, 1.15)	0.92	(0.76, 1.12)	0.91	(0.75, 1.11)
Age						
Continuous	1.01	(1.00, 1.02)	1.01	(1.00, 1.02)	1.01	(1.00, 1.02)
Education						
High degree	1		1		1	
Secondary qualif	0.77	(0.60, 0.98)*	0.78	(0.61, 1.00)*	0.78	(0.61, 1.00)*
No qualification	0.94	(0.71, 1.23)	0.96	(0.73, 1.27)	0.97	(0.74, 1.27)
Smoking						
Never smoker	1		1		1	
Ex-smoker	1.20	(0.96, 1.49)	1.19	(0.96, 1.48)	1.19	(0.96, 1.49)
Smoker	1.84	(1.41, 2.41)**	1.73	(1.32, 2.26)**	1.74	(1.33, 2.28)**
Physical activity						
Active	1		1		1	
Non-active	1.89	(1.48, 2.41)**	1.88	(1.47, 2.40)**	1.86	(1.45, 2.38)**
Employment status						
Employed	1		1		1	
Retired	1.55	(1.18, 2.04)*	1.53	(1.16, 2.01)*	1.51	(1.15, 1.99)*
Other inactive	2.18	(1.62, 2.93)**	2.14	(1.60, 2.88)**	2.08	(1.55, 2.79)**
Marital status						
Married			1		1	
Single			0.97	(0.62, 1.51)	0.95	(0.61, 1.48)
Separated			1.62	(1.24, 2.12)**	1.62	(1.23, 2.12)**
Widowed			1.15	(0.87, 1.52)	1.15	(0.87, 1.51)
Childhood Health						
Good					1	
Poor					1.42	(1.08, 1.87)*

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001*

Table 55. Linear regression models between grip strength and social trajectories sequentially adjusted for covariates ß Coefficient (95%CI)

Imputed data analysis; w3 n=9805; Maximum grip strength (GS): Mean= 31.0 kg (SD=13.7)

	Model 1 GS +Social trajectories (Unadjusted model)		Model 1+gender		Model 1+gender+age	
Social Trajectories						
Stable High	0		0		0	
Up Mid-High	-0.44	(-1.32, 0.43)	-1.17	(-1.82, -0.52)**	-0.85	(-1.43, -0.27)*
Up Low-High	-1.55	(-3.15, -0.01)*	-1.64	(-2.77, -0.50)*	-1.12	(-2.13, -0.11)*
Down High-Mid	-2.57	(-3.79, -1.35)**	-1.52	(-2.40, -0.64)*	-0.55	(-1.30, 0.20)
Stable Middle	-2.76	(-3.77, -1.76)**	-2.31	(-3.06, -1.55)**	-1.20	(-1.86, -1.55)**
Up Low-Mid	-2.09	(-3.72, -0.46)*	-1.61	(-2.86, -0.35)*	-1.02	(-2.16, 0.13)
Down High-Low	-5.42	(-6.85, -4.00)**	-3.65	(-4.70, -2.59)**	-2.29	(-3.25, -1.32)**
Down Mid-Low	-5.11	(-6.05, -4.17)**	-4.25	(-4.96, -3.53)**	-2.56	(-3.20, -1.92)**
Stable Low	-5.58	(-6.73, -4.42)**	-4.79	(-5.69, -3.88)**	-3.18	(-3.99, -2.36)**
Gender						
Men			0		0	
Women			-16.52	(-16.93, -16.10)**	-15.98	(-16.39, -15.61)**
Age						
Continuous					-0.41	(-0.42, -0.39)**
Education						
High degree						
Secondary qualif						
No qualification						
Smoking						
Never smoker						
Ex-smoker						
Smoker						
Physical activity						
Active						
Non-active						
Employment status						
Employed						
Retired						
Other inactive						
Marital status						
Married						
Single						
Separated						
Widowed						
Childhood Health						
Good						
Poor						

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001*

Table 56. Linear regression models between grip strength and social trajectories sequentially adjusted for covariates ß Coefficient (95%CI)

Imputed data analysis; w3 n=9805; Maximum grip strength (GS): Mean= 31.0 kg (SD=13.7)

	Model 1+gender+age +education		Model 1+gender+age +education +smoking		Model 1+gender+age +education +smoking +physical activity	
Social Trajectories						
Stable High	0		0		0	
Up Mid-High	-0.60	(-1.18, -0.02)*	-0.57	(-1.15, 0.01)	-0.57	(-1.15, 0.00)
Up Low-High	-0.68	(-1.69, 0.32)	-0.65	(-1.66, 0.36)	-0.65	(-1.66, 0.36)
Down High-Mid	-0.10	(-0.86, 0.66)	-0.05	(-0.81, 0.71)	-0.02	(-0.80, 0.73)
Stable Middle	-0.54	(-1.23, 0.15)	-0.48	(-1.17, 0.21)	-0.46	(-1.15, 0.22)
Up Low-Mid	-0.22	(-1.36, 0.93)	-0.12	(-1.26, 1.02)	-0.06	(-1.20, 1.07)
Down High-Low	-1.54	(-2.52, -0.57)*	-1.46	(-2.43, -0.48)*	-1.41	(-2.37, -0.44)*
Down Mid-Low	-1.63	(-2.32, -0.93)**	-1.51	(-2.21, -0.81)**	-1.41	(-2.10, -0.72)**
Stable Low	-2.15	(-3.03, -1.27)**	-2.00	(-2.86, -1.12)**	-1.81	(-2.69, -0.94)**
Gender						
Men	0		0		0	
Women	-15.79	(-16.26, -15.42)**	-15.73	(-16.11, -15.35)**	-15.91	(-16.29, -15.54)**
Age						
Continuous	-0.39	(-0.41, -0.37)**	-0.40	(-0.42, -0.38)**	-0.38	(-0.40, -0.36)**
Education						
High degree	0		0		0	
Secondary qual	-1.18	(-1.63, -0.72)**	-1.16	(-1.61, -0.72)**	-1.18	(-1.63, -0.73)**
No qualification	-1.78	(-2.31, -1.24)**	-1.73	(-2.27, -1.20)**	-1.56	(-2.09, -1.04)**
Smoking						
Never smoker			0		0	
Ex-smoker			0.43	(0.04, 0.82)*	0.46	(0.07, 0.84)*
Smoker			-0.72	(-1.37, -0.07)*	-0.52	(-1.16, 0.12)
Physical activity						
Active					0	
Non-active					-3.05	(-3.68, -2.43)**
Employment status						
Employed						
Retired						
Other inactive						
Marital status						
Married						
Single						
Separated						
Widowed						
Childhood Health						
Good						
Poor						

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001*

Table 57. Linear regression models between grip strength and social trajectories sequentially adjusted for covariates ß Coefficient (95%CI)
Imputed data analysis; w3 n=9805; Maximum grip strength (GS): Mean= 31.0 kg (SD=13.7)

	Model 1 +gender+age+educ +smoking +physical activity+ employment st		Model 1+gender+age +educ+smoking +phys act +employment+marital st		Model 1+gender+age +educ +smoking +physical act+ employment +marital st +child health (Fully adjusted model)	
Social Trajectories						
Stable High	0		0		0	
Up Mid-High	-0.55	(-1.12, 0.03)	-0.54	(-1.11, 0.03)	-0.53	(-1.10, 0.04)
Up Low-High	-0.66	(-1.66, 0.35)	-0.65	(-1.65, 0.35)	-0.63	(-1.64, 0.37)
Down High-Mid	-0.02	(-0.77, 0.74)	0.03	(-0.72, 0.78)	0.04	(-0.71, 0.79)
Stable Middle	-0.43	(-1.10, 0.25)	-0.40	(-1.08, 0.28)	-0.38	(-1.06, 0.29)
Up Low-Mid	-0.01	(-1.11, 1.13)	0.06	(-1.06, 1.18)	0.08	(-1.04, 1.20)
Down High-Low	-1.23	(-2.19, -0.28)*	-1.13	(-2.10, -0.17)*	-1.11	(-2.07, -0.14)*
Down Mid-Low	-1.29	(-1.98, -0.61)**	-1.19	(-1.89, -0.50)*	-1.16	(-1.86, -0.46)*
Stable Low	-1.60	(-2.47, -0.74)**	-1.48	(-2.35, -0.60)*	-1.44	(-2.31, -0.57)*
Gender						
Men	0		0		0	
Women	-15.68	(-16.06, -15.31)**	-15.65	(-16.04, -15.27)**	-15.65	(-16.03, -15.26)**
Age						
Continuous	-0.36	(-0.38, -0.33)**	-0.35	(-0.38, -0.33)**	-0.35	(-0.38, -0.33)**
Education						
High degree	0		0		0	
Secondary qualif	-1.06	(-1.50, -0.61)**	-1.09	(-1.54, -0.64)**	-1.10	(-1.54, -0.65)**
No qualification	-1.30	(-1.83, -0.76)**	-1.34	(-1.87, -0.81)**	-1.35	(-1.88, -0.82)**
Smoking						
Never smoker	0		0		0	
Ex-smoker	0.49	(0.10, 0.87)*	0.48	(0.10, 0.87)*	0.48	(0.09, 0.86)*
Smoker	-0.35	(-0.99, 0.28)	-0.29	(-0.94, 0.35)	-0.30	(-0.95, 0.34)
Physical activity						
Active	0		0		0	
Non-active	-2.83	(-3.45, -2.21)**	-2.81	(-3.43, -2.19)**	-2.79	(-3.41, -2.17)**
Employment status						
Employed	0		0		0	
Retired	-1.41	(-1.89, -0.94)**	-1.41	(-1.89, -0.93)**	-1.38	(-1.86, -0.90)**
Other inactive	-2.88	(-3.56, -2.20)**	-2.86	(-3.54, -2.18)**	-2.80	(-3.49, -2.11)**
Marital status						
Married			0		0	
Single			-0.95	(-1.77, -0.13)*	-0.94	(-1.76, -0.11)*
Separated			-0.48	(-1.11, 0.15)	-0.48	(-1.12 0.15)
Widowed			-0.28	(-0.84, 0.28)	-0.29	(-0.85, 0.27)
Childhood Health						
Good					0	
Poor					-0.74	(-1.47, -0.02)*

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001*

Table 58 to Table 72 show the results of the logistic and linear regression models used to test the association between general health, oral health and physical function and intergenerational social mobility trajectories, with the sequential inclusion of covariates, using the variable age as age groups.

Table 58. Logistic regression models between self-rated general health and social trajectories sequentially adjusted for covariates using age group OR (95%CI)
Imputed data analysis; w3 n=8659; poor self-rated general health: 33.6%

	Model 1 SRH +Social trajectories (Unadjusted model)		Model 1+gender		Model 1+gender+age group	
Social Trajectories						
Stable High	1		1		1	
Up Mid-High	1.23	(1.02, 1.49)*	1.23	(1.02, 1.49)*	1.19	(0.99, 1.45)
Up Low-High	1.56	(1.17, 2.10)*	1.56	(1.17, 2.10)*	1.54	(1.15, 2.06)*
Down High-Mid	1.44	(1.13, 1.84)*	1.44	(1.13, 1.84)*	1.35	(1.06, 1.70)*
Stable Middle	1.70	(1.40, 2.06)**	1.70	(1.40, 2.06)**	1.62	(1.34, 1.96)**
Up Low-Mid	2.18	(1.63, 2.92)**	2.18	(1.63, 2.92)**	2.13	(1.59, 2.87)**
Down High-Low	2.72	(2.11, 3.49)**	2.72	(2.12, 3.50)**	2.57	(2.00, 3.28)**
Down Mid-Low	3.17	(2.65, 3.78)**	3.17	(2.65, 3.78)**	2.91	(2.44, 3.45)**
Stable Low	4.48	(3.65, 5.50)**	4.48	(3.65, 5.50)**	4.12	(3.35, 5.07)**
Gender						
Men			1		1	
Women			0.99	(0.90, 1.09)	0.95	(0.86, 1.04)
Age group						
50 to 64					1	
64 to 74					1.33	(1.18, 1.03)**
75 and over					2.13	(1.88, 2.40)**

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001*

Table 59. Logistic regression models between self-rated general health and social trajectories sequentially adjusted for covariates using age group OR (95%CI)
Imputed data analysis; w3 n=8659; poor self-rated general health: 33.6%

	Model 1+gender+age gr +education		Model 1+gender+age +education +smoking		Model 1+gender+age +education +smoking +physical activity	
Social Trajectories						
Stable High	1		1		1	
Up Mid-High	1.10	(0.91, 1.343	1.09	(0.91, 1.32)	1.08	(0.90, 1.31)
Up Low-High	1.34	(1.00, 1.79)*	1.33	(1.00, 1.78)	1.32	(0.99, 1.78)
Down High-Mid	1.15	(0.90, 1.48)	1.14	(0.89, 1.47)	1.09	(0.85, 1.41)
Stable Middle	1.30	(1.06, 1.58)*	1.27	(1.04, 1.56)*	1.23	(1.00, 1.51)*
Up Low-Mid	1.63	(1.21, 2.21)*	1.58	(1.16, 2.13)*	1.57	(1.15, 2.13)*
Down High-Low	1.95	(1.50, 2.53)**	1.89	(1.46, 2.46)**	1.77	(1.36, 2.30)**
Down Mid-Low	2.10	(1.73, 2.54)**	2.00	(1.65, 2.43)**	1.93	(1.59, 2.36)**
Stable Low	2.81	(2.25, 3.51)**	2.64	(2.11, 3.30)**	2.60	(2.07, 3.27)**
Gender						
Men	1		1		1	
Women	0.88	(0.80, 0.97)*	0.91	(0.82, 1.01)	0.99	(0.89, 1.10)
Age group						
50 to 64	1		1		1	
64 to 74	1.21	(1.08, 1.36)*	1.26	(1.12, 1.42)**	1.23	(1.09, 1.39)*
75 and over	1.85	(1.63, 2.09)**	1.98	(1.74, 2.25)**	1.71	(1.59, 1.95)**
Education						
High degree	1		1		1	
Secondary qualif	1.39	(1.22, 1.58)**	1.36	(1.20, 1.55)**	1.35	(1.18, 1.54)**
No qualification	1.98	(1.72, 2.27)**	1.90	(1.65, 2.19)**	1.79	(1.55, 2.06)**
Smoking						
Never smoker			1		1	
Ex-smoker			1.22	(1.09, 1.36)**	1.21	(1.08, 1.35)*
Smoker			1.83	(1.58, 2.12)**	1.77	(1.53, 2.06)**
Physical activity						
Active					1	
Non-active					3.11	(2.67, 3.62)**

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001.*

Table 60. Logistic regression models between self-rated general health and social trajectories sequentially adjusted for covariates using age group (95%CI)
Imputed data analysis; w3 n=8659; poor self-rated general health: 33.6%

	Model 1 +gender+age gr +educ +smoking +physical activity+ employment st		Model 1+gender+age gr +educ+smoking +phys act +employment+marital st		Model 1+gender+age gr +educ +smoking +physical act+ employment +marital st +child health (Fully adjusted model)	
Social Trajectories						
Stable High	1		1		1	
Up Mid-High	1.08	(0.89, 1.31)	1.08	(0.89, 1.31)	1.08	(0.89, 1.31)
Up Low-High	1.34	(0.99, 1.82)	1.33	(0.98, 1.81)	1.33	(0.97, 1.79)
Down High-Mid	1.11	(0.86, 1.44)	1.07	(0.83, 1.39)	1.06	(0.82, 1.38)
Stable Middle	1.25	(1.01, 1.54)*	1.22	(0.99, 1.51)	1.22	(0.98, 1.50)
Up Low-Mid	1.58	(1.15, 2.17)*	1.54	(1.12, 2.11)*	1.53	(1.11, 2.10)*
Down High-Low	1.63	(1.25, 2.14)**	1.53	(1.17, 2.02)*	1.52	(1.16, 2.01)*
Down Mid-Low	1.87	(1.53, 2.28)**	1.76	(1.44, 2.16)**	1.73	(1.41, 2.11)**
Stable Low	2.48	(1.96, 3.12)**	2.33	(1.84, 2.95)**	2.30	(1.82, 2.91)**
Gender						
Men	1		1		1	
Women	0.86	(0.77, 0.96)*	0.84	(0.75, 0.94)*	0.83	(0.74, 0.93)*
Age group						
50 to 64	1		1		1	
64 to 74	0.85	(0.74, 0.99)*	0.86	(0.74, 1.00)*	0.86	(0.74, 0.99)*
75 and over	1.15	(0.98, 1.35)	1.16	(0.98, 1.37)	1.16	(0.99, 1.37)
Education						
High degree	1		1		1	
Secondary qualif	1.28	(1.12, 1.47)**	1.30	(1.14 1.49)**	1.31	(1.14, 1.50)**
No qualification	1.61	(1.39, 1.86)**	1.65	(1.43, 1.91)**	1.68	(1.45, 1.95)**
Smoking						
Never smoker	1		1		1	
Ex-smoker	1.20	(1.07, 1.35)*	1.20	(1.07, 1.35)*	1.20	(1.07, 1.35)*
Smoker	1.70	(1.46, 1.99)**	1.62	(1.38, 1.89)**	1.65	(1.41, 1.93)**
Physical activity						
Active	1		1		1	
Non-active	2.78	(2.39, 3.24)**	2.78	(2.38, 3.24)**	2.75	(2.36, 3.22)**
Employment status						
Employed	1		1		1	
Retired	2.51	(2.14, 2.93)**	2.48	(2.12, 2.90)**	2.45	(2.10, 2.87)**
Other inactive	4.49	(3.80, 5.30)**	4.47	(3.79, 5.29)**	4.30	(3.64, 5.09)**
Marital status						
Married			1		1	
Single			1.33	(1.06, 1.67)*	1.28	(1.02, 1.61)*
Separated			1.57	(1.33, 1.86)**	1.58	(1.34, 1.87)**
Widowed			1.08	(0.93, 1.26)	1.09	(0.93, 1.27)
Childhood Health						
Good					1	
Poor					2.09	(1.77, 2.46)**

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001.*

Table 61. Logistic regression models between self-rated oral health and social trajectories sequentially adjusted for covariates using age group OR (95%CI)
Imputed data analysis; w3 n=8659; poor self-rated oral health (SRoH): 19.1%

	Model 1 SRoH +Social trajectories (Unadjusted model)		Model 1+gender		Model 1+gender+age gr	
Social Trajectories						
Stable High	1		1		1	
Up Mid-High	0.86	(0.69, 1.07)	0.85	(0.68, 1.06)	0.86	(0.69, 1.07)
Up Low-High	0.87	(0.61, 1.24)	0.87	(0.61, 1.24)	0.88	(0.62, 1.25)
Down High-Mid	1.07	(0.81, 1.41)	1.09	(0.82, 1.43)	1.11	(0.84, 1.46)
Stable Middle	1.10	(0.89, 1.38)	1.11	(0.89, 1.39)	1.13	(0.91, 1.42)
Up Low-Mid	1.23	(0.88, 1.71)	1.23	(0.88, 1.71)	1.25	(0.90, 1.74)
Down High-Low	1.38	(1.02, 1.87)*	1.42	(1.04, 1.92)*	1.46	(1.07, 1.98)*
Down Mid-Low	1.50	(1.23, 1.83)**	1.51	(1.24, 1.85)**	1.57	(1.28, 1.93)**
Stable Low	1.51	(1.19, 1.91)*	1.52	(1.20, 1.92)*	1.57	(1.24, 1.99)**
Gender						
Men			1		1	
Women			0.80	(0.72, 0.90)**	0.81	(0.73, 0.91)**
Age group						
50 to 64					1	
64 to 74					0.81	(0.70, 0.93)*
75 and over					0.81	(0.70, 0.94)*

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001.*

Table 62. Logistic regression models between self-rated oral health and social trajectories sequentially adjusted for covaraites using age group OR (95%CI)
Imputed data analysis; w3 n=8659; poor self-rated oral health (SRoH): 19.1%

	Model 1+gender+age gr +education		Model 1+gender+age gr +education +smoking		Model 1+gender+age gr +education +smoking +physical activity	
Social Trajectories						
Stable High	1		1		1	
Up Mid-High	0.83	(0.66, 1.03)	0.82	(0.66, 1.02)	0.81	(0.65, 1.01)
Up Low-High	0.82	(0.57, 1.17)	0.81	(0.57, 1.15)	0.80	(0.56, 1.14)
Down High-Mid	1.03	(0.78, 1.37)	1.02	(0.77, 1.35)	0.99	(0.76, 1.31)
Stable Middle	1.02	(0.81, 1.29)	1.00	(0.79, 1.26)	0.97	(0.77, 1.23)
Up Low-Mid	1.09	(0.78, 1.52)	1.04	(0.74, 1.45)	1.03	(0.73, 1.44)
Down High-Low	1.26	(0.91, 1.72)	1.20	(0.88, 1.65)	1.14	(0.83, 1.56)
Down Mid-Low	1.33	(1.06, 1.64)*	1.24	(0.99, 1.54)	1.20	(0.96, 1.49)
Stable Low	1.26	(0.97, 1.62)	1.15	(0.89, 1.49)	1.12	(0.86, 1.45)
Gender						
Men	1		1		1	
Women	0.78	(0.69, 0.88)**	0.81	(0.72, 0.91)**	0.86	(0.76, 0.96)*
Age group						
50 to 64	1		1		1	
64 to 74	0.76	(0.66, 0.88)**	0.79	(0.69, 0.91)*	0.78	(0.67, 0.89)**
75 and over	0.74	(0.63, 0.86)**	0.79	(0.68, 0.93)*	0.71	(0.60, 0.83)**
Education						
High degree	1		1		1	
Secondary qualif	1.06	(0.91, 1.23)	1.03	(0.89, 1.20)	1.02	(0.88, 1.19)
No qualification	1.48	(1.26, 1.75)**	1.42	(1.20, 1.67)**	1.35	(1.14, 1.59)*
Smoking						
Never smoker			1		1	
Ex-smoker			1.27	(1.11, 1.44)**	1.26	(1.10, 1.44)*
Smoker			1.95	(1.65, 2.29)**	1.91	(1.62, 2.25)**
Physical activity						
Active					1	
Non-active					2.01	(1.71, 2.35)**

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001.*

Table 63. Logistic regression models between self-rated oral health and social trajectories sequentially adjusted for covariates using age group OR (95%CI)
Imputed data analysis; w3 n=8659; poor self-rated oral health (SRoH): 19.1%

	Model 1 +gender+age gr +educ +smoking +physical activity+ employment st		Model 1+gender+age gr +educ+smoking +phys act +employment+marital st		Model 1+gender+age gr +educ +smoking +physical act+ employment +marital st +child health (Fully adjusted model)	
Social Trajectories						
Stable High	1		1		1	
Up Mid-High	0.81	(0.65, 1.01)	0.81	(0.65, 1.01)	0.81	(0.65, 1.01)
Up Low-High	0.80	(0.56, 1.15)	0.79	(0.55, 1.13)	0.78	(0.55, 1.12)
Down High-Mid	0.98	(0.75, 1.30)	0.94	(0.71, 1.24)	0.93	(0.71, 1.23)
Stable Middle	0.97	(0.77, 1.22)	0.94	(0.74, 1.19)	0.93	(0.74, 1.18)
Up Low-Mid	1.02	(0.72, 1.43)	0.98	(0.70, 1.37)	0.97	(0.69, 1.36)
Down High-Low	1.11	(0.81, 1.52)	1.00	(0.73, 1.39)	1.00	(0.72, 1.38)
Down Mid-Low	1.18	(0.94, 1.47)	1.08	(0.86, 1.35)	1.06	(0.85, 1.33)
Stable Low	1.10	(0.84, 1.42)	1.00	(0.77, 1.30)	0.99	(0.76, 1.29)
Gender						
Men	1		1		1	
Women	0.83	(0.74, 0.93)*	0.80	(0.71, 0.91)**	0.80	(0.71, 0.90)**
Age group						
50 to 64	1		1		1	
64 to 74	0.84	(0.71, 0.99)*	0.85	(0.72, 1.01)	0.85	(0.71, 1.01)
75 and over	0.77	(0.64, 0.93)*	0.79	(0.65, 0.96)*	0.79	(0.65, 0.96)**
Education						
High degree	1		1		1	
Secondary qualif	1.01	(0.87, 1.17)	1.03	(0.88, 1.20)	1.03	(0.88, 1.20)
No qualification	1.31	(1.11, 1.55)*	1.36	(1.15, 1.61)**	1.37	(1.16, 1.62)**
Smoking						
Never smoker	1		1		1	
Ex-smoker	1.27	(1.11, 1.45)**	1.26	(1.11, 1.44)*	1.27	(1.11, 1.45)**
Smoker	1.88	(1.59, 2.22)**	1.75	(1.47, 2.07)**	1.76	(1.49, 2.08)**
Physical activity						
Active	1		1		1	
Non-active	1.93	(1.65, 2.27)**	1.93	(1.65, 2.27)**	1.91	(1.63, 2.25)**
Employment st						
Employed	1		1		1	
Retired	0.94	(0.79, 1.11)	0.91	(0.77, 1.09)	0.91	(0.76, 1.08)
Other inactive	1.32	(1.11, 1.59)*	1.29	(1.08, 1.55)*	1.26	(1.05, 1.51)*
Marital status						
Married			1		1	
Single			1.41	(1.10, 1.80)*	1.38	(1.08, 1.77)*
Separated			1.85	(1.56, 2.20)**	1.85	(1.58, 2.21)**
Widowed			1.11	(0.93, 1.33)	1.11	(0.93, 1.33)
Childhood Health						
Good					1	
Poor					1.45	(1.21, 1.74)**

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001.*

Table 64. Logistic regression models between total tooth loss and social trajectories sequentially adjusted for covariates using age group OR (95%CI)
Imputed data analysis; w3 n=8659; Total tooth loss (TTL): 17.9%

	Model 1 TTL +Social trajectories (Unadjusted model)		Model 1+gender		Model 1+gender+age gr	
Social Trajectories						
Stable High	1		1		1	
Up Mid-High	1.40	(1.06, 1.86)*	1.43	(1.08, 1.89)*	1.30	(1.00, 1.73)*
Up Low-High	2.51	(1.72, 3.66)**	2.54	(1.74, 3.71)**	2.60	(1.76, 3.83)**
Down High-Mid	1.76	(1.24, 2.48)*	1.72	(1.22, 2.43)*	1.41	(0.99, 2.00)
Stable Middle	2.23	(1.69, 2.95)**	2.22	(1.68, 2.92)**	1.96	(1.47, 2.56)**
Up Low-Mid	3.06	(2.10, 4.44)**	3.08	(2.11, 4.47)**	3.06	(2.27, 4.60)**
Down High-Low	3.48	(2.51, 4.84)**	3.36	(2.42, 4.67)**	2.98	(2.11, 4.53)**
Down Mid-Low	4.86	(3.78, 6.24)**	4.81	(3.75, 6.18)**	4.06	(3.15, 5.23)**
Stable Low	6.57	(5.02, 8.60)**	6.57	(5.01, 8.60)**	5.76	(4.36, 7.61)**
Gender						
Men			1		1	
Women			1.39	(1.23, 1.57)**	1.28	(1.12, 1.46)*
Age group						
50 to 64					1	
64 to 74					3.17	(2.68, 3.74)**
75 and over					8.88	(7.57, 10.42)**

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001.*

Table 65. Logistic regression models between total tooth loss and social trajectories sequentially adjusted for covariates using age group OR (95%CI)
Imputed data analysis; w3 n=8659; Total tooth loss (TTL): 17.9%

	Model 1+gender + age gr +education		Model 1+gender+age gr +education +smoking		Model 1+gender+age gr +education +smoking +physical activity	
Social Trajectories						
Stable High	1		1		1	
Up Mid-High	1.18	(0.88, 1.57)	1.17	(0.90, 1.56)	1.17	(0.87, 1.57)
Up Low-High	2.18	(1.46, 3.24)**	2.19	(1.46, 3.27)**	2.21	(1.48, 3.30)**
Down High-Mid	1.17	(0.82, 1.68)	1.17	(0.81, 1.68)	1.14	(0.79, 1.65)
Stable Middle	1.51	(1.13, 2.03)*	1.48	(1.10, 2.00)*	1.48	(1.09, 1.99)*
Up Low-Mid	2.25	(1.50, 3.37)**	2.17	(1.45, 3.27)**	2.18	(1.45, 3.28)**
Down High-Low	2.15	(1.51, 3.08)**	2.10	(1.46, 3.01)**	2.05	(1.43, 2.94)**
Down Mid-Low	2.76	(2.10, 3.64)**	2.59	(1.96, 3.42)**	2.56	(1.94, 3.38)**
Stable Low	3.67	(2.71, 4.97)**	3.35	(2.46, 4.57)**	3.34	(2.45, 4.55)**
Gender						
Men	1		1		1	
Women	1.17	(1.03, 1.34)*	1.30	(1.13, 1.49)*	1.35	(1.17, 1.54)**
Age group						
50 to 64	1		1		1	
64 to 74	2.86	(2.41, 3.39)**	3.20	(2.69, 3.82)**	3.17	(2.65, 3.78)**
75 and over	7.63	(6.47, 9.00)**	9.16	(7.70, 10.90)**	8.62	(7.24, 10.27)**
Education						
High degree	1		1		1	
Secondary qualif	1.30	(1.08, 1.57)*	1.25	(1.04, 1.52)*	1.24	(1.03, 1.50)*
No qualification	2.16	(1.79, 2.62)**	2.03	(1.68, 2.46)**	1.97	(1.62, 2.39)**
Smoking						
Never smoker			1		1	
Ex-smoker			1.60	(1.38, 1.87)**	1.58	(1.36, 1.84)**
Smoker			3.16	(2.60, 3.85)**	3.11	(2.55, 3.78)**
Physical activity						
Active					1	
Non-active					1.61	(1.35, 1.91)*

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001.*

Table 66. Logistic regression models between total tooth loss and social trajectories sequentially adjusted for covariates using age group OR (95%CI)
Imputed data analysis; w3 n=8659; Total tooth loss (TTL): 17.9%

	Model 1 +gender+age gr +educ +smoking +physical activity+ employment st		Model 1+gender+age gr +educ+smoking +phys act +employment+ marital st		Model 1+gender+age gr +educ +smoking +physical act+ employment +marital st +child health (Fully adjusted model)	
Social Trajectories						
Stable High	1		1		1	
Up Mid-High	1.17	(0.87, 1.56)	1.18	(0.88, 1.58)	1.18	(0.88, 1.58)
Up Low-High	2.19	(1.47, 3.28)**	2.18	(1.46, 3.25)**	2.17	(1.46, 3.24)**
Down High-Mid	1.15	(0.79, 1.66)	1.10	(0.76, 1.59)	1.10	(0.76, 1.59)
Stable Middle	1.48	(1.09, 1.99)*	1.44	(1.07, 1.95)*	1.44	(1.07, 1.95)*
Up Low-Mid	2.17	(1.44, 3.28)**	2.15	(1.43, 3.24)**	2.14	(1.42, 3.22)**
Down High-Low	2.02	(1.41, 2.90)**	1.88	(1.30, 2.71)*	1.87	(1.30, 2.70)**
Down Mid-Low	2.54	(1.92, 3.36)**	2.41	(1.82, 3.19)**	2.40	(1.81, 3.17)**
Stable Low	3.30	(2.42, 4.50)**	3.12	(2.28, 4.27)**	3.11	(2.27, 4.25)**
Gender						
Men	1		1		1	
Women	1.33	(1.16, 1.53)**	1.25	(1.09, 1.44)*	1.25	(1.08, 1.44)*
Age group						
50 to 64	1		1		1	
64 to 74	2.64	(2.13, 3.28)**	2.57	(2.07, 3.20)**	2.57	(2.07, 3.20)**
75 and over	7.06	(5.67, 8.79)**	6.28	(5.00, 7.89)**	6.29	(5.01, 7.90)**
Education						
High degree	1		1		1	
Secondary qualif	1.23	(1.02, 1.49)*	1.24	(1.03, 1.51)*	1.24	(1.03, 1.51)*
No qualification	1.93	(1.59, 2.35)**	1.94	(1.60, 2.36)**	1.95	(1.60, 2.36)**
Smoking						
Never smoker	1		1		1	
Ex-smoker	1.57	(1.35, 1.83)**	1.58	(1.36, 1.84)**	1.58	(1.36, 1.84)**
Smoker	3.06	(2.52, 3.73)**	3.07	(2.52, 3.74)**	3.08	(2.53, 3.76)**
Physical activity						
Active	1		1		1	
Non-active	1.58	(1.33, 1.87)**	1.57	(1.32, 1.86)*	1.56	(1.31, 1.85)*
Employment st						
Employed	1		1		1	
Retired	1.46	(1.14, 1.86)*	1.44	(1.12, 1.83)*	1.43	(1.12, 1.83)*
Other inactive	1.38	(1.07, 1.78)*	1.38	(1.07, 1.79)*	1.37	(1.06, 1.77)*
Marital status						
Married			1		1	
Single			1.08	(0.80, 1.47)	1.08	(0.79, 1.46)
Separated			1.02	(0.81, 1.29)	1.02	(0.81, 1.29)
Widowed			1.38	(1.17, 1.63)**	1.38	(1.17, 1.63)
Childhood Health						
Good					1	
Poor					1.20	(0.97, 1.49)

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001.*

Table 67. Logistic regression models between oral impacts on daily performance and social trajectories sequentially adjusted for covariates using age group OR (95%CI)

Imputed data analysis; w3 n=8659; At least one oral impact on daily performance (OIDP): 6.4%

	Model 1 OIDP +Social trajectories (Unadjusted model)		Model 1+gender		Model 1+gender+age gr	
Social Trajectories						
Stable High	1		1		1	
Up Mid-High	0.96	(0.68, 1.36)	0.96	(0.68, 1.36)	0.94	(0.66, 1.33)
Up Low-High	1.23	(0.71, 2.13)	1.23	(0.71, 2.12)	1.20	(0.69, 2.08)
Down High-Mid	1.27	(0.80, 1.99)	1.27	(0.81, 2.00)	1.22	(0.77, 1.92)
Stable Middle	1.18	(0.81, 1.71)	1.18	(0.81, 1.71)	1.13	(0.78, 1.65)
Up Low-Mid	1.25	(0.72, 2.17)	1.25	(0.72, 2.17)	1.22	(0.70, 2.11)
Down High-Low	1.52	(0.93, 2.47)	1.53	(0.94, 2.50)	1.45	(0.88, 2.37)
Down Mid-Low	1.59	(1.14, 2.22)*	1.60	(1.15, 2.23)*	1.48	(1.06, 2.10)*
Stable Low	1.60	(1.09, 2.34)*	1.60	(1.09, 2.34)*	1.49	(1.01, 2.19)*
Gender						
Men			1		1	
Women			0.96	(0.80, 1.16)	0.94	(0.78, 1.12)
Age group						
50 to 64					1	
64 to 74					1.52	(1.22, 1.88)**
75 and over					1.58	(1.25, 2.00)**

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001.*

Table 68. Logistic regression models between oral impacts on daily performance and social trajectories sequentially adjusted for covariates using age group OR (95%CI)
Imputed data analysis; w3 n=8659; At least one oral impact on daily performance (OIDP): 6.4%

	Model 1+gender+age +education		Model 1+gender+age +education +smoking		Model 1+gender+age +education +smoking +physical activity	
Social Trajectories						
Stable High	1		1		1	
Up Mid-High	0.94	(0.66, 1.33)	0.93	(0.66, 1.32)	0.93	(0.65, 1.31)
Up Low-High	1.20	(0.69, 2.08)	1.18	(0.68, 2.05)	1.18	(0.68, 2.06)
Down High-Mid	1.24	(0.79, 1.96)	1.22	(0.77, 1.93)	1.18	(0.75, 1.86)
Stable Middle	1.14	(0.78, 1.68)	1.11	(0.76, 1.63)	1.08	(0.74, 1.59)
Up Low-Mid	1.22	(0.70, 2.13)	1.16	(0.66, 2.03)	1.14	(0.65, 2.00)
Down High-Low	1.42	(0.86, 2.36)	1.36	(0.82, 2.26)	1.28	(0.77, 2.12)
Down Mid-Low	1.44	(1.00, 2.09)	1.34	(0.93, 1.94)	1.30	(0.90, 1.87)
Stable Low	1.41	(0.93, 2.16)	1.29	(0.84, 1.97)	1.25	(0.81, 1.92)
Gender						
Men	1		1		1	
Women	0.93	(0.76, 1.13)	0.97	(0.80, 1.17)	1.03	(0.86, 1.25)
Age group						
50 to 64	1		1		1	
64 to 74	1.49	(1.20,1.85)**	1.57	(1.26, 1.95)**	1.54	(1.23, 1.92)**
75 and over	1.53	(1.20, 1.95)*	1.67	(1.31, 2.13)**	1.48	(1.16, 1.88)*
Education						
High degree	1		1		1	
Secondary qualif	0.82	(0.64, 1.05)	0.80	(0.63, 1.03)	0.79	(0.62, 1.01)
No qualification	1.10	(0.84, 1.44)	1.05	(0.80, 1.38)	0.99	(0.75, 1.30)
Smoking						
Never smoker			1		1	
Ex-smoker			1.22	(0.98, 1.52)	1.20	(0.97, 1.50)
Smoker			1.98	(1.52, 2.47)**	1.91	(1.47, 2.49)**
Physical activity						
Active					1	
Non-active					2.09	(1.64, 2.66)**

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001.*

Table 69. Logistic regression models between oral impacts on daily performance and social trajectories sequentially adjusted for covariates using age group OR (95%CI)

Imputed data analysis; w3 n=8659; At least one oral impact on daily performance (OIDP): 6.4%

	Model 1 +gender+age gr +educ +smoking +physical activity+ employment st		Model 1+gender+age gr +educ+smoking +phys act +employment+marital st		Model 1+gender+age gr +educ +smoking +physical act+ employment +marital st +child health (Fully adjusted model)	
Social Trajectories						
Stable High	1		1		1	
Up Mid-High	0.92	(0.65, 1.31)	0.92	(0.65, 1.31)	0.92	(0.65, 1.30)
Up Low-High	1.19	(0.68, 2.07)	1.16	(0.66, 2.04)	1.16	(0.66, 2.02)
Down High-Mid	1.18	(0.74, 1.87)	1.13	(0.71, 1.79)	1.12	(0.71, 1.78)
Stable Middle	1.08	(0.73, 1.58)	1.04	(0.71, 1.53)	1.04	(0.71, 1.52)
Up Low-Mid	1.12	(0.64, 1.97)	1.08	(0.62, 1.90)	1.07	(0.61, 1.88)
Down High-Low	1.21	(0.73, 2.01)	1.11	(0.67, 1.85)	1.10	(0.67, 1.83)
Down Mid-Low	1.26	(0.87, 1.82)	1.17	(0.80, 1.69)	1.15	(0.79, 1.67)
Stable Low	1.20	(0.78, 1.84)	1.11	(0.72, 1.71)	1.10	(0.72, 1.70)
Gender						
Men	1		1		1	
Women	0.96	(0.79, 1.16)	0.92	(0.76, 1.12)	0.92	(0.75, 1.12)
Age group						
50 to 64	1		1		1	
64 to 74	1.41	(1.09, 1.84)*	1.42	(1.09, 1.86)*	1.42	(1.09, 1.85)*
75 and over	1.35	(1.02, 1.79)*	1.34	(1.00, 1.79)	1.34	(1.00, 1.80)
Education						
High degree	1		1		1	
Secondary qualif	0.76	(0.60, 0.98)*	0.77	(0.61, 0.99)*	0.77	(0.60, 0.99)*
No qualification	0.93	(0.71, 1.22)	0.95	(0.72, 1.25)	0.95	(0.73, 1.26)
Smoking						
Never smoker	1		1		1	
Ex-smoker	1.20	(0.97, 1.50)	1.20	(0.96, 1.49)	1.20	(0.96, 1.49)
Smoker	1.85	(1.42, 2.42)**	1.74	(1.33, 2.28)**	1.75	(1.34, 2.29)**
Physical activity						
Active	1		1		1	
Non-active	1.93	(1.52, 2.47)**	1.93	(1.51, 2.46)**	1.90	(1.49, 2.43)**
Employment st						
Employed	1		1		1	
Retired	1.39	(1.05, 1.86)*	1.37	(1.02, 1.82)*	1.35	(1.01, 1.80)*
Other inactive	2.10	(1.56, 2.83)**	2.07	(1.54, 2.78)**	2.01	(1.49, 2.70)**
Marital status						
Married			1		1	
Single			0.99	(0.63, 1.54)	0.96	(0.62, 1.50)
Separated			1.63	(1.24, 2.13)**	1.62	(1.24, 2.12)**
Widowed			1.19	(0.91, 1.55)	1.19	(0.91, 1.55)
Childhood Health						
Good					1	
Poor					1.42	(1.07, 1.87)*

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001.*

Table 70. Logistic regression models between grip strength and social trajectories sequentially adjusted logistic for covariates using age group ß Coefficient (95%CI)
Imputed data analysis; w3 n=9805; Maximum grip strength (GS): Mean= 31.0 kg (SD=13.7)
Using age group

	Model 1 GS +Social trajectories (Unadjusted model)		Model 1+gender		Model 1+gender+age gr	
Social Trajectories						
Stable High	0		0		0	
Up Mid-High	-0.44	(-1.32, 0.43)	-1.17	(-1.82, -0.52)**	-0.84	(-1.43, -0.27)*
Up Low-High	-1.55	(-3.15, -0.01)*	-1.64	(-2.77, -0.50)*	-1.16	(-2.13, -0.11)*
Down High-Mid	-2.57	(-3.79, -1.35)**	-1.52	(-2.40, -0.64)*	-0.72	(-1.30, 0.20)
Stable Middle	-2.76	(-3.77, -1.76)**	-2.31	(-3.06, -1.55)**	-1.34	(-1.86, -1.55)**
Up Low-Mid	-2.09	(-3.72, -0.46)*	-1.61	(-2.86, -0.35)*	-1.06	(-2.16, 0.13)
Down High-Low	-5.42	(-6.85, -4.00)**	-3.65	(-4.70, -2.59)**	-2.59	(-3.25, -1.32)**
Down Mid-Low	-5.11	(-6.05, -4.17)**	-4.25	(-4.96, -3.53)**	-2.77	(-3.20, -1.92)**
Stable Low	-5.58	(-6.73, -4.42)**	-4.79	(-5.69, -3.88)**	-3.27	(-3.99, -2.36)**
Gender						
Men			0		0	
Women			-16.52	(-16.93, -16.10)**	-16.07	(-16.39, -15.61)**
Age group						
50 to 64					0	
64 to 74					-4.36	(-4.76, -3.96)**
75 and over					-10.23	(-10.72, -9.75)**

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001.*

Table 71. Logistic regression models between grip strength and social trajectories sequentially adjusted for covariates using age group ß Coefficient (95%CI)

Imputed data analysis; w3 n=9805; Maximum grip strength (GS): Mean= 31.0 kg (SD=13.7)

	Model 1+gender+age gr +education		Model 1+gender+age gr +education +smoking		Model 1+gender+age gr +education +smoking +physical activity	
Social Trajectories						
Stable High	0		0		0	
Up Mid-High	-0.55	(-1.14, 0.03)	-0.54	(-1.12, 0.05)	-0.54	(-1.12, 0.04)
Up Low-High	-0.67	(-1.69, 0.34)	-0.65	(-1.67, 0.37)	-0.65	(-1.67, 0.37)
Down High-Mid	-0.22	(-0.99, 0.56)	-0.19	(-0.96, 0.59)	-0.15	(-0.91, 0.62)
Stable Middle	-0.61	(-1.30, 0.09)	-0.56	(-1.26, 0.14)	-0.54	(-1.24, 0.15)
Up Low-Mid	-0.16	(-1.31, 0.98)	-0.09	(-1.23, 1.05)	-0.04	(-1.17, 1.09)
Down High-Low	-1.74	(-2.71, -0.76)*	-1.68	(-2.66, -0.70)*	-1.61	(-2.58, -0.65)*
Down Mid-Low	-1.71	(-2.41, -1.00)**	-1.63	(-2.34, -0.92)**	-1.51	(-2.21, -0.81)**
Stable Low	-2.10	(-2.98, -1.21)**	-1.99	(-2.88, -1.11)**	-1.79	(-2.67, -0.91)**
Gender						
Men	0		0		0	
Women	-15.85	(-16.23, -15.47)**	-15.82	(-16.20, -15.43)**	-16.02	(-16.40, -15.64)**
Age group						
50 to 64	0		0		0	
64 to 74	-4.10	(-4.50, -3.69)**	-4.16	(-4.56, -3.76)**	-4.09	(-4.49, -3.69)**
75 and over	-9.83	(-10.32, -9.34)**	-9.95	(-10.45, -9.45)**	-9.48	(-9.98, -8.98)**
Education						
High degree	0		0		0	
Secondary qual	-1.22	(-1.68, -0.76)**	-1.21	(-1.67, -0.76)**	-1.22	(-1.67, -0.77)**
No qualification	-2.05	(-2.59, -1.51)**	-2.02	(-2.56, -1.48)**	-1.80	(-2.34, -1.04)**
Smoking						
Never smoker			0		0	
Ex-smoker			0.27	(-0.12, 0.67)	0.31	(-0.08, 0.84)*
Smoker			-0.50	(-1.15, 0.15)	-0.30	(-0.94, 0.12)
Physical activity						
Active					0	
Non-active					-3.38	(-4.02, -2.43)**

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001.*

Table 72. Logistic regression models between grip strength and social trajectories sequentially adjusted for covariates using age group ß Coefficient (95%CI)

Imputed data analysis; w3 n=9805; Maximum grip strength (GS): Mean= 31.0 kg (SD=13.7)

	Model 1 +gender+age gr +educ +smoking +physical activity+ employment st		Model 1+gender+age gr +educ+smoking +phys act +employment+marital st		Model 1+gender+age gr +educ +smoking +physical act+ employment +marital st + child health (Fully adjusted model)	
Social Trajectories						
Stable High	0		0		0	
Up Mid-High	-0.51	(-1.09, 0.07)	-0.51	(-1.08, 0.07)	-0.50	(-1.10, 0.08)
Up Low-High	-0.67	(-1.68, 0.34)	-0.66	(-1.67, 0.34)	-0.65	(-1.64, 0.36)
Down High-Mid	-0.16	(-0.92, 0.60)	-0.09	(-0.84, 0.67)	-0.08	(-0.71, 0.68)
Stable Middle	-0.51	(-1.19, 0.17)	-0.45	(-1.14, 0.23)	-0.44	(-1.06, 0.24)
Up Low-Mid	0.01	(-1.10, 1.12)	0.07	(-1.04, 1.19)	0.10	(-1.04, 1.21)
Down High-Low	-1.42	(-2.38, -0.47)*	-1.23	(-2.19, -0.27)*	-1.21	(-2.07, -0.24)*
Down Mid-Low	-1.38	(-2.07, -0.68)**	-1.20	(-1.91, -0.50)*	-1.17	(-1.86, -0.46)*
Stable Low	-1.55	(-2.48, -0.68)**	-1.35	(-2.23, -0.47)*	-1.31	(-2.31, -0.44)*
Gender						
Men	0		0		0	
Women	-15.73	(-16.11, -15.35)**	-15.62	(-16.01, -15.24)**	-15.62	(-16.03, -15.23)**
Age group						
50 to 64	0		0		0	
64 to 74	-2.89	(-3.37, -2.41)**	-2.83	(-3.32, -2.35)**	-2.83	(-3.31, -2.35)**
75 and over	-8.14	(-8.72, -7.57)**	-7.86	(-8.47, -7.25)**	-7.86	(-8.47, -7.25)**
Education						
High degree	0		0		0	
Secondary qualif	-1.09	(-1.54, -0.63)**	-1.14	(-1.59, -0.68)**	-1.10	(-1.59, -0.69)**
No qualification	-1.51	(-2.04, -0.97)**	-1.53	(-2.07, -0.99)**	-1.35	(-2.08, -1.01)**
Smoking						
Never smoker	0		0		0	
Ex-smoker	0.38	(-0.00 0.78)	0.38	(-0.01, 0.77)*	0.48	(-0.02 0.76)
Smoker	-0.12	(-0.76, 0.52)	-0.07	(-0.72, 0.57)	-0.30	(-0.73, 0.34)
Physical activity						
Active	0		0		0	
Non-active	-3.12	(-3.75, -2.50)**	-3.09	(-3.72, -2.46)**	-2.79	(-3.70, -2.45)**
Employment status						
Employed	0		0		0	
Retired	-2.51	(-3.00, -2.01)**	-2.47	(-2.96, -1.98)**	-1.38	(-2.93, -1.95)**
Other inactive	-3.23	(-3.91, -2.55)**	-3.22	(-3.90, -2.54)**	-2.80	(-3.86, -2.48)**
Marital status						
Married			0		0	
Single			-0.87	(-1.70, -0.04)*	-0.94	(-1.68, -0.02)*
Separated			-0.45	(-1.09, 0.19)	-0.48	(-1.09, 0.18)
Widowed			-0.95	(-1.57, -0.40)*	-0.29	(-1.52, -0.41)*
Childhood Health						
Good					0	
Poor					-0.74	(-1.48, -0.05)*

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001.*

Appendix G. Complete case analysis

The aim of conducted a sensitivity analysis using only complete cases was to compare the results of using a different approach to deal with missing data. Complete case analysis is a very common approach to deal with missing data with the advantage that the all analyses are based on the same set of observations.

The regression analysis described on the previous section was replicated using a complete case analysis approach, restricting the analytical sample to only those individuals who had complete data in all variables and meet the inclusion/exclusion criteria (only core members aged 50 and over were included and respondents who had moved into institutions were excluded), resulting in a wave 3 analytical sample of 5,972 individuals and a wave 4 analytical sample of 4,498 individuals.

The pattern of missing data is presented within the results chapter (section 3.4.1). The frequency distribution of missingness was explored by socioeconomic position, covariates and outcomes. Overall, the missingness was less than 2.5%, but a significant proportion of individuals were excluded because of three reasons: either their parental occupation could not be classified (wave 3: 19%; wave 4: 19%), their grip strength was not measured (23.8%), or they had no information regarding childhood self-rated health (wave 3: 19.9%; wave 4: 37.2%).

G.1 Descriptive analysis

Table 73 displays the socio-demographic characteristics of wave 3 and wave 4 complete case analytical samples.

The distribution of socio-demographic characteristics observed in the complete case analysis showed the same direction than the distribution observed in the imputed data analytical samples. At both waves (wave 3 and wave 4) women were slightly over represented. Wave 3 complete case analysis was slightly younger than wave 4 sample (wave 3 mean age: 65.2, SD 11.2; wave 4 mean age: 66.6, SD 12.1). Most individuals had some qualification, were retired or economically inactive and were married.

Regarding general health and oral health, as expected, the prevalence was lower on the complete case analysis than on the imputed data analysis. On the complete case analysis 30.2% of individuals reported poor general health, 17.7% reported poor oral health, 15.4% had no natural teeth and 5.9% experienced at least one oral impact on daily performance. But, the general and oral health distribution followed the same pattern, from the highest to lowest prevalence: poor general health was more common than poor oral health, which in turn was more common than total tooth loss; lastly, OIDP were the least common health problem reported.

In terms of socioeconomic position, the distribution was the same at both analyses – complete case and imputed data–. At childhood, most individuals were classified at the middle SEP. At adulthood, most individuals were classified within the high SEP. Equally to the imputed analysis, the complete case analysis showed that from childhood to adulthood the proportion of individuals at high SEP and at low SEP increased resulting in a considerable decreased of the middle SEP.

Table 73. Socio-demographic characteristics of analytic samples wave 3 and wave 4, complete case analysis versus imputed data analysis (%)

	Complete cases data		Imputed data	
	w3 n=5972	w4 n=4498	w3 n=8659	w4 n=9805
Gender				
Men	47.0	47.6	46.8	47.0
Women	53.0	52.4	53.2	53.0
Age group				
50 to 64	54.3	50.8	51.9	53.7
65 to 74	25.4	24.6	25.3	24.8
74+	20.3	24.5	22.7	21.5
Childhood SEP				
Managerial/ Professional (High)	30.1	30.2	30.5	31.7
Intermediate (Middle)	47.5	47.3	50.5	50.1
Routine/Manual (Low)	22.4	22.4	19.0	18.1
Adult SEP (household SEP)				
Managerial/ Professional (High)	41.4	41.0	39.4	41.3
Intermediate (Middle)	25.8	27.0	25.5	25.1
Routine/Manual (Low)	32.8	32.0	35.1	33.5
Self-rated Health				
Good health	69.8		66.4	
Poor health	30.2		33.6	
Self-rated Oral Health				
Good oral health	82.3		80.9	
Poor oral health	17.7		19.1	
Edentulousness				
Dentate	84.6		82.1	
Edentate	15.4		17.9	
Oral Impacts				
No impact	94.1		93.6	
Impact	5.9		6.4	
Grip Strength: Mean(SD)		31.2 (13.6)		31.0 (13.7)
Education				
High degree	41.0	41.8	36.7	37.9
Secondary qualification	31.5	32.4	30.4	30.6
No qualification	27.5	25.7	32.9	31.6
Employment status				
Employed	37.5	35.4	35.0	36.8
Retired	48.7	53.7	50.0	49.5
Other inactive	13.8	10.9	15.0	13.7
Marital status				
Married	67.1	67.1	68.5	69.2
Single	5.9	6.0	5.4	5.5
Separated	11.4	10.3	9.8	9.7
Widowed	15.6	16.7	16.4	15.7
Childhood self-rated health				
Good health	88.4	88.6	87.7	87.8
Poor health	11.6	11.4	12.3	12.2
Age continuous: Mean(SD)	65.2 (11.2)	66.6 (12.1)	65.8 (11.6)	65.7 (12.0)

Cross-sectional weighted percentages

G.1.1. Differences on socio-demographic characteristics and outcomes between men and women

The distribution of socio-demographic characteristics by gender on the complete case analysis was similar to the distribution of the same characteristics on imputed data analysis (Table 74).

On the complete case analysis, women and men were similar in age, but men were more likely to have a higher education, be employed, and be married.

In terms of socioeconomic position, just like in the imputed analysis, the complete case analysis showed that at childhood more men belonged to middle SEP than women, and more women belonged at high SEP than men. This changed at adulthood, more men belonged at high SEP than women and more women belonged middle and low SEP than men, therefore, women were more likely to experienced downward mobility, and men were more likely to experienced upward mobility from childhood to adulthood.

Lastly, on both analyses –complete case and imputed data– men were more likely to reported poor oral health and women were more likely to reported total tooth loss and had lower grip strength. The only observed difference was that on the compete case analysis men were more likely to reported at least on oral impact on daily performance, while the imputed analysis suggested no difference by gender on reporting OIDP.

Table 74. Analytic sample socio-demographic characteristics and outcomes distributions by gender, complete case analysis versus imputed data analysis (%)

	Complete case data				Imputed data			
	Wave 3 n=5972		Wave 4 n=4498		Wave 3 n=8659		Wave 4 n=9805	
	Men n=2677	Women n= 3295	Men n=2036	Women n= 2462	Men n=3877	Women n= 4782	Men n=4398	Women n=5407
Age group								
50 to 64	57.3	51.7	53.8	48.2	54.9	49.4	56.2	51.5
65 to 74	24.5	26.2	24.4	24.9	25.4	25.3	25.2	24.5
74+	18.2	22.1	21.9	26.9	19.8	25.3	18.7	24.0
Childhood SEP								
High	28.1	31.8	28.0	32.3	28.9	31.9	30.7	32.7
Middle	49.5	45.7	50.2	44.7	51.7	49.5	51.5	48.9
Low	22.3	22.5	21.8	23.0	19.5	18.6	17.8	18.4
Adult SEP								
High	45.5	37.7	45.7	36.7	43.1	36.2	45.1	38.0
Middle	23.6	27.7	24.3	29.4	24.4	26.4	24.2	26.0
Low	30.9	34.6	30.0	33.8	32.4	37.4	30.7	36.1
Self-rated health								
Good	70.1	69.5			66.8	66.0		
Poor	29.9	30.5			33.2	34.0		
Self-rated oral health								
Good	80.4	83.9			79.4	82.3		
Poor	19.6	16.1			20.6	17.7		
Grip Str Mean(SD)			40.0 (11.5)	23.1 (7.9)			39.8 (17.1)	23.1 (12.3)
Edentulousness								
Dentate	87.3	82.2			84.9	79.7		
Edentate	12.7	17.8			15.1	20.3		
Oral impact								
No impact	93.6	94.5			93.5	93.6		
Impact	6.4	5.5			6.5	6.4		
Education								
High degree	50.2	32.8	51.1	33.3	45.3	29.1	46.2	30.4
Secondary qualif	28.4	34.3	28.8	35.7	28.5	32.1	28.2	32.7
No qualification	21.4	32.8	20.0	30.9	26.2	38.7	25.6	36.8
Employment status								
Employed	44.2	31.6	42.3	29.1	41.3	29.5	43.6	30.8
Retired	47.7	49.6	50.4	56.6	49.5	50.4	47.1	51.7
Other inactive	8.1	18.8	7.2	14.3	9.1	20.1	9.3	17.5
Marital status								
Married	75.1	60.0	75.7	59.2	77.3	60.7	77.0	62.2
Single	6.7	5.2	6.7	5.3	6.1	4.7	6.6	4.5
Separated	9.9	12.7	8.3	12.1	8.3	11.1	8.1	11.0
Widowed	8.2	22.1	9.3	23.5	8.4	23.4	8.3	22.2
Childhood health								
Good health	88.9	88.0	89.0	88.1	88.4	87.1	88.6	87.2
Poor health	11.1	12.0	11.0	11.9	11.6	12.9	11.4	12.8

Cross-sectional weighted percentages

G.1.2. Social mobility trajectories distribution

Both analyses, complete case and multiple imputation, presented similar trajectories distributions (Table 75). Among individuals moving upward or downward, most mobility occurred from middle SEP, and the most uncommon trajectories were upward mobility from high SEP to middle and high SEP and downward mobility form high to low SEP. However, the complete case analysis suggested a slight higher distribution of upward than downward mobility, while the imputed data analysis suggested the opposite.

Table 75. Social mobility trajectories distributions complete case data versus imputed data (%)

	Complete case data		Imputed data	
	w3 n=5972	w4 n=4498	w3 n=8659	w4 n=9805
Social Trajectories				
Stable High	17.1	16.5	16.6	17.5
Stable Middle	12.6	13.2	13.6	13.2
Stable Low	10.8	10.5	10.4	9.5
Total stable	**40.5**	**40.2**	**40.6**	**40.2**
Upward Middle to High	18.4	18.4	18.6	19.3
Upward Low to High	5.9	6.1	4.2	4.4
Upward Low to Middle	5.7	5.8	4.4	4.1
Total upwardly mobile	**30.0**	**30.3**	**27.2**	**27.8**
Downward Middle to Low	16.5	15.7	18.4	17.6
Downward High to Middle	7.5	7.9	7.5	7.8
Downward High to Low	5.5	5.9	6.3	6.4
Total downwardly mobile	**29.5**	**29.5**	**32.2**	**31.8**

Percentages un-weighted

G.1.3. Bivariate association between socio-demographic characteristics, social trajectories and behaviours and general health, oral health and physical function

Table 76 and Table 77 present the complete case data bivariate regression analyses between socio-demographic characteristics and the outcomes.

Results showed that the complete case analysis underestimated the magnitude of the associations compared to the imputed data analysis. Generally, the estimates and significance were lower on the complete case analysis. However, most of the associations showed the same direction.

Specifically, older, less educated, retired, economically inactive, smokers, physically inactive and individuals with poor childhood general health were more likely to had poor general health, poor oral health, total tooth loss, at least one OIDP and lower grip strength. Also, the same exception was evidenced, younger respondents were more likely to report poor oral health than their older peers. Furthermore, women were more likely to report good oral health and had lower grip strength and men were less likely to report total tooth loss. However, slight differences were found between analyses. For example, the complete case analysis showed no statistical evidence of an association between educational level and at least one OIDP; and no significant association between child self-rated general health and total tooth loss.

In terms of socioeconomic position, the complete case analysis showed similar associations than the imputed data analysis. Poor self-rated general health, total tooth loss and grip strength showed a graded association with childhood SEP and adult SEP. Self-rated oral health and at least one OIDP showed no statistical significant association with childhood SEP. Nevertheless, the complete case analysis gave no statistical evidence of an association between adult SEP and at least one OIDP and only evidence of an association of adult low SEP with self-rated oral health. Although, the same direction than on imputed analysis was suggested. In terms of social mobility trajectories, the same linear associations were observed.

Table 76. Unadjusted regression models between health and function and socio-demographic characteristics **MODEL 1 Complete case analysis**

	w3 n=5972 OR (95% C.I)								w4 n=4498 Coef (95% C.I)	
	Self-rated health Poor/fair 30.2%		Self-rated oral health Poor/fair 17.7%		Total tooth loss 15.4%		Oral impacts on daily performance 5.9%		Mean grip Strength Mean (SD)= 31.2 (13.6))	
Gender										
Men	1		1		1		1		0	
Women	1.03	(0.91, 1.15)	0.79	(0.68, 0.91)*	1.49	(1.28, 1.74)**	0.85	(0.68, 1.07)	-16.85	(-17.44, -16.26)**
Age group										
50 to 64	1		1		1		1		0	
65 to 74	1.44	(1.25, 1.66)**	0.81	(0.68, 0.96)*	3.30	(2.69, 4.06)**	1.41	(1.08, 1.84)*	-5.08	(-5.91, -4.33)**
74+	2.07	(1.79, 2.40)**	0.71	(0.58, 0.86)**	8.01	(6.56, 9.78)**	1.35	(1.01, 1.79)*	-12.10	(-12.96, -11.24)**
Education										
High degree	1		1		1		1		0	
Secondary qualif	1.73	(1.50, 2.00)**	1.04	(0.87, 1.23)	2.09	(1.69, 2.58)**	0.92	(0.70, 1.22)	-5.06	(-5.95, -4.17)**
No qualification	3.20	(2.77, 3.71)**	1.35	(1.13, 1.60)**	6.02	(4.95, 7.32)**	1.26	(0.96, 1.65)	-8.82	(-9.80, -7.87)**
Childhood SEP										
High	1		1		1		1		0	
Middle	1.41	(1.22, 1.62)**	1.04	(0.88, 1.23)	1.78	(1.46, 2.17)**	1.10	(0.84, 1.45)	-0.35	(-1.27, 0.57)
Low	2.06	(1.75, 2.43)**	1.16	(0.95, 1.41)	2.97	(2.39, 3.69)**	1.33	(0.97, 1.82)	-1.48	(-2.58, -0.37)*
Adult SEP										
High	1		1		1		1		0	
Middle	1.41	(1.21, 1.64)**	1.16	(0.97, 1.39)	1.68	(1.36, 2.07)**	1.06	(0.79, 1.41)	-2.55	(-3.53, -1.57)**
Low	2.71	(2.36, 3.11)**	1.48	(1.25, 1.74)**	3.45	(2.87, 4.14)**	1.29	(0.99, 1.68)	-4.02	(-4.95, -3.09)**
Social Trajectories										
Stable High	1		1		1		1		0	
Up Mid-High	1.24	(1.01, 1.54)*	0.81	(0.63, 1.03)	1.67	(1.20, 2.34)*	1.03	(0.70, 1.52)	0.08	(-1.19, 1.34)
Up Low-High	1.36	(1.01, 1.82)*	0.91	(0.64, 1.27)	2.75	(1.82, 4.13)**	1.45	(0.88, 2.41)	-2.30	(-4.00, -0.60)*
Down High-Mid	1.40	(1.07, 1.84)*	1.03	(0.76, 1.40)	1.84	(1.22, 2.77)*	1.24	(0.76, 2.02)	-3.02	(-4.73, -1.32)*
Stable Middle	1.64	(1.31, 2.07)**	1.03	(0.79, 1.34)	2.62	(1.86, 3.70)**	1.14	(0.74, 1.75)	-3.08	(-4.49, -1.68)**
Up Low-Mid	1.94	(1.45, 2.60)**	1.09	(0.78, 1.54)	3.50	(2.35, 5.23)**	1.01	(0.55, 1.84)	-2.11	(-4.21, -0.01)*
Down High-Low	2.25	(1.68, 3.01)**	1.04	(0.73, 1.49)	3.61	(2.41, 5.42)**	1.02	(0.56, 1.89)	-5.14	(-6.97, -3.33)**
Down Mid-Low	2.82	(2.28, 3.48)**	1.39	(1.09, 1.76)*	4.77	(3.48, 6.53)**	1.37	(0.92, 2.04)	-3.93	(-5.34, -2.52)**
Stable Low	4.30	(3.42, 5.43)**	1.39	(1.06, 1.82)*	7.16	(5.16, 9.93)**	1.61	(1.05, 2.47)*	-4.47	(-5.99, -2.96)**

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001*

Table 77. Unadjusted regression models between health and physical function and socio-demographic characteristics and behaviours **MODEL 1 Complete case analysis**

	w3 n=5972 OR (95% C.I)								w4 n=6508 Coef (95% C.I)	
	Self-rated health Poor/fair		Self-rated oral health Poor/fair		Total tooth loss		Oral impacts on daily performance		Mean grip Strength	
Employment status										
Employed	1		1		1		1		0	
Retired	3.01	(2.60, 3.49)**	0.86	(0.74, 1.01)	5.24	(4.18, 6.57)**	1.57	(1.20, 2.06)*	-9.22	(-10.03, -8.41)**
Other inactive	6.08	(5.02, 7.36)**	1.42	(1.15, 1.75)**	3.93	(2.97, 5.21)**	2.19	(1.56, 3.08)**	-9.48	(-10.81, -8.16)**
Marital status										
Married	1		1		1		1		0	
Single	1.41	(1.10, 1.81)*	165	(1.25, 2.18)**	1.01	(0.69, 1.48)	1.02	(0.62, 1.70)	-1.28	(-3.03, 0.47)
Separated	1.61	(1.35, 1.93)**	1.84	(1.50, 2.25)**	1.30	(1.01, 1.67)*	1.90	(1.38, 2.61)**	-2.53	(-3.81, -1.25)**
Widowed	1.76	(1.51, 2.06)**	1.05	(0.86, 1.28)	3.53	(2.96, 4.21)**	1.40	(1.04, 1.89)*	-10.78	(-11.66, -9.89)**
Chid health										
Good	1		1		1		1		0	
Poor	2.20	(1.86, 2.61)**	1.50	(1.22, 1.83)**	1.24	(1.00, 1.54)	1.63	(1.21, 2.21)*	-1.61	(-2.85, -0.36)*
Smoking										
Never smoker	1		1		1		1		0	
Ex-smoker	1.29	(1.13, 1.47)**	1.32	(1.12, 1.55)*	1.61	(1.35, 1.93)**	1.41	(1.09, 1.84)*	1.53	(0.67, 2.39)**
Smoker	2.10	(1.76, 2.50)**	2.12	(1.73, 2.61)**	2.47	(1.98, 3.07)**	2.05	(1.48, 2.83)**	1.04	(-0.21, 2.29)
Physical activity										
Active	1		1		1		1		0	
Non-active	3.69	(3.06, 4.44)**	2.12	(1.73, 2.61)**	2.37	(1.92, 2.93)**	2.22	(1.64, 3.01)**	-4.33	(-5.68, -2.97)**

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001*

Reference Table. Unadjusted regression models between health and function and socio-demographic characteristics **MODEL 1** **Imputed data**

	w3 n=8659 OR (95% C.I)								w4 n=9805 Coef (95% C.I)	
	Self-rated Health Poor/fair (33.6%)		Self-rated Oral Health Poor/fair (19.1%)		Total Tooth Loss (17.9%)		Oral Impacts on Daily Performance (6.4%)		Mean Grip Strength Mean (SD)= 31.0 (13.7)	
Gender										
Men	1		1		1		1		0	
Women	1.04	(0.95, 1.14)	0.83	(0.74, 0.93)*	1.44	(1.28, 1.62)**	0.99	(0.82, 1.19)	-16.70	(-17.12, -16.28)**
Age group										
50 to 64	1		1		1		1		0	
65 to 74	1.42	(1.27, 1.60)**	0.84	(0.74, 0.96)*	3.37	(2.86, 3.96)**	1.57	(1.26, 1.94)**	-4.81	(-5.36, -4.26)**
74+	2.33	(2.08, 2.62)**	0.85	(0.74, 0.98)*	9.44	(8.08, 11.04)**	1.65	(1.32, 2.08)**	-11.91	(-12.54, -11.27)**
Education										
High degree	1		1		1		1		0	
Secondary qualif	1.76	(1.56, 1.98)**	1.08	(0.94, 1.24)	2.10	(1.77, 2.48)**	0.96	(0.76, 1.21)	-4.83	(-5.47, -4.19)**
No qualification	3.26	(2.91, 3.66)**	1.51	(1.32, 1.73)**	5.64	(4.83, 6.58)**	1.49	(1.20, 1.84)**	-8.39	(-9.04, -7.74)**
Childhood SEP										
High	1		1		1		1		0	
Middle	1.40	(1.24, 1.57)**	1.05	(0.90, 1.22)	1.67	(1.41, 1.97)**	1.06	(0.84, 1.34)	-0.96	(-1.62, -0.31)*
Low	2.19	(1.87, 2.55)**	1.18	(0.99, 1.42)	2.83	(2.33, 3.44)**	1.22	(0.91, 1.64)	-2.06	(-2.97, -1.16)**
Adult SEP										
High	1		1		1		1		0	
Middle	1.46	(1.29, 1.65)**	1.21	(1.05, 1.41)*	1.66	(1.41, 1.97)**	1.21	(0.95, 1.55)	-2.22	(-2.91, -1.52)**
Low	2.93	(2.62, 3.28)**	1.61	(1.41, 1.84)**	3.77	(3.27, 4.36)**	1.58	(1.27, 1.96)**	-4.93	(-5.57, -4.29)**
Social Trajectories										
Stable High	1		1		1		1		0	
Up Mid-High	1.23	(1.02, 1.49)*	0.86	(0.69, 1.07)	1.40	(1.06, 1.86)*	0.96	(0.68, 1.36)	-0.44	(-1.32, 0.43)
Up Low-High	1.56	(1.17, 2.10)*	0.87	(0.61, 1.24)	2.51	(1.72, 3.66)**	1.23	(0.71, 2.13)	-1.55	(-3.15, -0.01)*
Down High-Mid	1.44	(1.13, 1.84)*	1.07	(0.81, 1.41)	1.76	(1.24, 2.48)*	1.27	(0.80, 1.99)	-2.57	(-3.79, -1.35)**
Stable Middle	1.70	(1.40, 2.06)**	1.10	(0.89, 1.38)	2.23	(1.69, 2.95)**	1.18	(0.81, 1.71)	-2.76	(-3.77, -1.76)**
Up Low-Mid	2.18	(1.63, 2.92)**	1.23	(0.88, 1.71)	3.06	(2.10, 4.44)**	1.25	(0.72, 2.17)	-2.09	(-3.72, -0.46)*
Down High-Low	2.72	(2.11, 3.49)**	1.38	(1.02, 1.87)*	3.48	(2.51, 4.84)**	1.52	(0.93, 2.47)	-5.42	(-6.85, -4.00)**
Down Mid-Low	3.17	(2.65, 3.78)**	1.50	(1.23, 1.83)**	4.86	(3.78, 6.24)**	1.59	(1.14, 2.22)*	-5.11	(-6.05, -4.17)**
Stable Low	4.48	(3.65, 5.50)**	1.51	(1.19, 1.91)*	6.57	(5.02, 8.60)**	1.60	(1.09, 2.34)*	-5.58	(-6.73, -4.42)**

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001*

Reference table Unadjusted regression models between health and physical function and socio-demographic characteristics and behaviours **Imputed data**

	w3 n=8659 OR (95% C.I)								w4 n=9805 Coef (95% C.I)	
	Self-rated Health Poor/fair		Self-rated Oral Health Poor/fair		Total Tooth Loss		Oral Impacts on Daily Performance		Mean Grip Strength	
Employment status										
Employed	1		1		1		1		0	
Retired	3.10	(2.75, 3.48)**	0.92	(0.81, 1.04)	5.92	(4.95, 7.09)**	1.91	(1.52, 2.41)**	-9.06	(-9.61, -8.52)**
Other inactive	6.07	(5.21, 7.07)**	1.55	(1.32, 1.82)**	4.01	(3.21, 5.00)**	2.74	(2.08, 3.59)**	-9.50	(-10.37, -8.62)**
Marital status										
Married	1		1		1		1		0	
Single	1.66	(1.36, 2.04)**	1.55	(1.22, 1.96)**	1.51	(1.15, 1.98)*	1.12	(0.73, 1.72)	-0.84	(-2.08, 0.39)
Separated	1.90	(1.64, 2.21)**	2.11	(1.79, 2.49)**	1.36	(1.09, 1.64)*	1.90	(1.46, 2.47)**	-2.81	(-3.68, -1.93)**
Widowed	1.96	(1.73, 2.22)**	1.09	(0.93, 1.28)	4.24	(3.70, 4.86)**	1.57	(1.24, 2.00)**	-10.65	(-11.32, -9.98)**
Chid health										
Good	1		1		1		1		0	
Poor	2.24	(1.92, 2.62)**	1.51	(1.27, 1.81)**	1.29	(1.06, 1.57)*	1.56	(1.19, 2.05)*	-2.03	(-3.04, -1.02)**
Smoking										
Never smoke	1		1		1		1		0	
Ex-smoker	1.32	(1.19, 1.46)**	1.32	(1.16, 1.50)**	1.62	(1.42, 1.86)**	1.28	(1.03, 1.58)*	1.97	(1.37, 2.56)**
Smoker	2.01	(1.75, 2.31)**	2.22	(1.89, 2.61)**	2.30	(1.94, 2.72)**	1.95	(1.50, 2.52)**	1.43	(0.57, 2.29)*
Physical activity										
Active	1		1		1		1		0	
Non-active	3.90	(3.38, 4.51)**	2.10	(1.81, 2.45)**	2.63	(2.26, 3.06)**	2.39	(1.89, 3.02)**	-4.17	(-5.04, -3.29)**

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001*

G.2 Multiple regressions analyses

The findings of the multiple regression sensitivity analysis which compared the effect of different approaches to handling missing data on the association between the outcomes and social trajectories are described at the end of each outcome chapter (Section 5.1.3, 5.2.3, 5.3.3, 5.4.3, 5.5.3).

Table 78 to Table 81 show the multiple regression analysis models between intergenerational social trajectories and the five studied outcomes using complete case data.

Overall, the complete case analysis underestimate the associations between social trajectories and the outcomes. The estimates and significance were lower, with one exception, the association between social trajectories and total tooth loss was slightly overestimated. However, the direction of association showed the same direction in all outcomes.

The full adjusted model (Model 5) showed the same associations than the ones found using imputed data, with the same direction and significance between the outcomes and gender, age, employment status, marital status and physical activity. Also, equally to the imputed data analysis, the complete case analysis suggested the same direction and significance of association between self-rated general health, self-rated oral health and total tooth loss with education, smoking and childhood health. However, the complete case analysis showed no statistical evidence of an association between OIDP and education, and between grip strength and smoking and poor childhood health.

Table 78. Regression models between health and function and social trajectories adjusted for gender and age **MODEL 2** **Complete data analysis**

	Self-rated health Poor/fair		Self-rated oral health Poor/fair		Total tooth loss		Oral impacts on daily performance		Mean grip Strength	
	w3 n=5972 OR (95% C.I)								w4 n=4498 Coef (95% C.I)	
Social Trajectories										
Stable High	1		1		1		1		0	
Up Mid-High	1.21	(0.98, 1.50)	0.80	(0.63, 1.02)	1.66	(1.18, 2.33)*	1.00	(0.68, 1.49)	-0.85	(-1.65, -0.04)*
Up Low-High	1.32	(0.99, 1.77)	0.92	(0.66, 1.30)	2.73	(1.78, 4.17)**	1.44	(0.87, 2.38)	-1.38	(-2.49, -0.28)*
Down High-Mid	1.31	(0.99, 1.72)	1.09	(0.80, 1.49)	1.34	(0.86, 2.09)	1.22	(0.75, 2.00)	-0.46	(-1.47, 0.55)
Stable Middle	1.54	(1.22, 1.95)**	1.08	(0.83, 1.41)	2.24	(1.58, 3.17)**	1.11	(0.72, 1.72)	-1.24	(-2.09, -0.38)*
Up Low-Mid	1.92	(1.43, 2.57)**	1.12	(0.79, 1.57)	3.73	(2.46, 5.67)**	1.00	(0.54, 1.84)	-1.13	(-2.49, 0.23)
Down High-Low	2.16	(1.60, 2.92)**	1.11	(0.78, 1.60)	3.27	(2.12, 5.04)**	1.03	(0.55, 1.90)	-1.65	(-2.84, -0.45)*
Down Mid-Low	2.65	(2.15, 3.28)**	1.46	(1.15, 1.86)*	4.35	(3.17, 5.97)**	1.33	(0.89, 1.99)	-2.12	(-2.97, -1.27)**
Stable Low	4.00	(3.16, 5.05)**	1.48	(1.13, 1.94)*	6.44	(4.62, 8.98)**	1.55	(1.01, 2.39)*	-2.59	(-3.56, -1.62)**
Gender										
Men	1		1		1		1		0	
Women	0.96	(0.85, 1.08)	0.78	(0.68, 0.90)*	1.32	(1.11, 1.56)*	0.83	(0.66, 1.04)	-16.13	(-16.63, -15.64)**
Age										
Continuous	1.03	(1.02, 1.03)**	0.98	(0.98, 0.99)**	1.09	(1.08, 1.10)**	1.01	(1.00, 1.02)*	-0.44	(-0.46, -0.42)**

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001*

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Reference table. Regression models between health and function and social trajectories adjusted for gender and age **MODEL 2** **Imputed data analysis**

	Self-rated health Poor/fair		Self-rated oral health Poor/fair		Total tooth loss		Oral impacts on daily performance		Mean grip Strength	
	w3 n=8659 OR (95% C.I)								w4 n=9805 Coef (95% C.I)	
Social Trajectories										
Stable High	1		1		1		1		0	
Up Mid-High	1.20	(1.00, 1.45)	0.86	(0.69, 1.06)	1.37	(1.03, 1.82)*	0.94	(0.66, 1.33)	-0.85	(-1.43, -0.27)*
Up Low-High	1.54	(1.15, 2.06)*	0.87	(0.61, 1.24)	2.66	(1.79, 3.96)**	1.21	(0.70, 2.09)	-1.12	(-2.13, -0.11)*
Down High-Mid	1.33	(1.04, 1.70)*	1.11	(0.84, 1.46)	1.29	(0.89, 1.88)	1.20	(0.76, 1.89)	-0.55	(-1.30, 0.20)
Stable Middle	1.61	(1.33, 1.96)**	1.13	(0.91, 1.41)	2.02	(1.51, 2.68)**	1.13	(0.78, 1.65)	-1.20	(-1.86, -1.55)**
Up Low-Mid	2.14	(1.59, 2.87)**	1.24	(0.89, 1.73)	3.26	(2.20, 4.85)**	1.23	(0.71, 2.13)	-1.02	(-2.16, 0.13)
Down High-Low	2.54	(1.97, 3.28)**	1.45	(1.06, 1.97)*	2.96	(2.08, 4.21)**	1.45	(0.89, 2.37)	-2.29	(-3.25, -1.32)**
Down Mid-Low	2.89	(2.42, 3.45)**	1.56	(1.27, 1.91)**	4.18	(3.23, 5.39)**	1.49	(1.06, 2.08)*	-2.56	(-3.20, -1.92)**
Stable Low	4.13	(3.36, 5.07)**	1.56	(1.23, 1.98)**	6.01	(4.54, 7.96)**	1.49	(1.01, 2.19)*	-3.18	(-3.99, -2.36)**
Gender										
Men	1		1		1		1		0	
Women	0.95	(0.86, 1.04)	0.81	(0.73, 0.91)**	1.23	(1.08, 1.40)*	0.93	(0.78, 1.12)	-15.98	(-16.39, -15.61)**
Age										
Continuous	1.03	(1.02, 1.03)**	0.99	(0.99, 1.00)*	1.09	(1.08, 1.10)**	1.02	(1.01, 1.03)**	-0.41	(-0.42, -0.39)**

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001*

Table 79. Regression models between health and physical function and social trajectories adjusted for gender, age and education **MODEL 3** **Complete data analysis**

	Self-rated health Poor/fair		Self-rated oral health Poor/fair		Total tooth loss		Oral impacts on daily performance		Mean grip Strength	
	w3 n=5972 OR (95% C.I)								w4 n=4498 Coef (95% C.I)	
Social Trajectories										
Stable High	1		1		1		1		0	
Up Mid-High	1.12	(0.90, 1.39)	0.78	(0.61, 1.00)*	1.48	(1.05, 2.08)*	1.01	(0.68, 1.49)	-0.64	(-1.45, 1.17)
Up Low-High	1.16	(0.86, 1.56)	0.88	(0.63, 1.25)	2.25	(1.46, 3.47)**	1.44	(0.87, 2.40)	-0.97	(-2.08, 0.13)
Down High-Mid	1.11	(0.84, 1.46)	1.04	(0.76, 1.42)	1.08	(0.69, 1.70)	1.25	(0.76, 2.05)	0.02	(-1.01, 1.04)
Stable Middle	1.22	(0.96, 1.56)	1.00	(0.76, 1.31)	1.64	(1.14, 2.37)*	1.13	(0.73, 1.76)	-0.59	(-1.48, 0.30)
Up Low-Mid	1.44	(1.07, 1.94)*	1.00	(0.71, 1.42)	2.60	(1.70, 3.98)**	1.01	(0.55, 1.85)	-0.30	(-1.68, 1.07)
Down High-Low	1.66	(1.22, 2.26)*	1.00	(0.68, 1.46)	2.32	(1.48, 3.62)**	1.03	(0.55, 1.92)	-0.97	(-2.18, 0.23)
Down Mid-Low	1.89	(1.50, 2.38)**	1.28	(0.99, 1.65)	2.78	(1.97, 3.92)**	1.34	(0.86, 2.07)	-1.22	(-2.13, -0.32)*
Stable Low	2.70	(2.10, 3.48)**	1.25	(0.93, 1.67)	3.83	(2.67, 5.50)**	1.52	(0.94, 2.46)	-1.60	(-2.64, -0.55)*
Gender										
Men	1		1		1		1		0	
Women	0.88	(0.77, 1.00)*	0.76	(0.65, 0.88)**	1.19	(1.00, 1.41)	0.83	(0.65, 1.05)	-15.91	(-16.41, -15.40)**
Age										
Continuous	1.02	(1.01, 1.03)**	0.98	(0.97, 0.99)**	1.08	(1.07, 1.09)**	1.01	(1.00, 1.02)	-0.43	(-0.45, -0.40)**
Education										
High degree	1		1		1		1		0	
Secondary qualif	1.41	(1.20, 1.65)**	1.04	(0.86, 1.25)	1.34	(1.06, 1.71)*	0.86	(0,64, 1.15)	-1.24	(-1.83, -0.65)**
No qualification	2.08	(1.74, 2.48)**	1.40	(1.14, 1.74)*	2.51	(1.97, 3.19)**	1.06	(0,75, 1.50)	-1.88	(-2.62, -1.14)**

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001*

Reference table. Regression models between health and physical function and social trajectories adjusted for gender, age and education **MODEL 3** **Imputed data analysis**

	Self-rated health Poor/fair		Self-rated oral health Poor/fair		Total tooth loss		Oral impacts on daily performance		Mean grip Strength	
	w3 n=8659 OR (95% C.I)								w4 n=9805 Coef (95% C.I)	
Social Trajectories										
Stable High	1		1		1		1		0	
Up Mid-High	1.11	(0.92, 1.34)	0.83	(0.66, 1.03)	1.24	(0.93, 1.66)	0.94	(0.67, 1.33)	-0.60	(-1.18, -0.02)*
Up Low-High	1.34	(1.00, 1.79)*	0.82	(0.57, 1.16)	2.25	(1.50, 3.36)**	1.20	(0.69, 2.08)	-0.68	(-1.69, 0.32)
Down High-Mid	1.15	(0.89, 1.47)	1.04	(0.79, 1.38)	1.10	(0.75, 1.59)	1.23	(0.78, 1.94)	-0.10	(-0.86, 0.66)
Stable Middle	1.30	(1.06, 1.59)*	1.02	(0.81, 1.29)	1.56	(1.16, 2.11)*	1.14	(0.78, 1.68)	-0.54	(-1.23, 0.15)
Up Low-Mid	1.64	(1.22, 2.22)*	1.09	(0.78, 1.53)	2.42	(1.61, 3.64)**	1.22	(0.70, 2.14)	-0.22	(-1.36, 0.93)
Down High-Low	1.94	(1.50, 2.52)**	1.25	(0.91, 1.72)	2.16	(1.50, 3.11)**	1.42	(0.86, 2.36)	-1.54	(-2.52, -0.57)*
Down Mid-Low	2.10	(1.73, 2.54)**	1.31	(1.06, 1.64)*	2.88	(2.18, 3.79)**	1.45	(1.00, 2.10)	-1.63	(-2.32, -0.93)**
Stable Low	2.84	(2.27, 3.55)**	1.26	(0.98, 1.63)	3.88	(2.85, 5.27)**	1.41	(0.92, 2.15)	-2.15	(-3.03, -1.27)**
Gender										
Men	1		1		1		1		0	
Women	0.88	(0.79, 0.97)*	0.78	(0.70, 0.88)**	1.14	(0.99, 1.30)	0.92	(0.77, 1.11)	-15.79	(-16.26, -15.42)**
Age										
Continuous	1.02	(1.02, 1.03)**	0.99	(0.98, 1.00)**	1.08	(1.08, 1.09)**	1.02	(1.01, 1.03)**	-0.39	(-0.41, -0.37)**
Education										
High degree	1		1		1		1		0	
Secondary qualif	1.38	(1.21, 1.57)**	1.05	(0.91, 1.22)	1.30	(1.07, 1.56)*	0.83	(0.64, 1.06)	-1.18	(-1.63, -0.72)**
No qualification	1.94	(1.69, 2.24)**	1.46	(1.24, 1.73)**	2.11	(1.74, 2.55)**	1.10	(0.84, 1.45)	-1.78	(-2.31, -1.24)**

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001*

Table 80. Regression models between health and physical function and social trajectories adjusted for gender, age, education and behaviours **MODEL 4** **Complete data analysis**

	Self-rated health Poor/fair		Self-rated oral health Poor/fair		Total tooth loss		Oral impacts on daily performance		Mean grip Strength	
	w3 n=5972 OR (95% C.I)								w4 n=4498 Coef (95% C.I)	
Social Trajectories										
Stable High	1		1		1		1		0	
Up Mid-High	1.08	(0.87, 1.35)	0.75	(0.59, 0.96)*	1.47	(1.04, 2.09)*	0.98	(0.66, 1.46)	-0.64	(-1.45, 1.16)
Up Low-High	1.17	(0.87, 1.58)	0.89	(0.63, 1.26)	2.33	(1.50, 3.63)**	1.46	(0.88, 2.43)	-1.04	(-2.14, 0.07)
Down High-Mid	1.06	(0.79, 1.41)	0.99	(0.72, 1.36)	1.05	(0.66, 1.66)	1.20	(0.73, 1.96)	0.09	(-0.93, 1.11)
Stable Middle	1.17	(0.91, 1.49)	0.95	(0.72, 1.25)	1.61	(1.11, 2.33)*	1.08	(0.70, 1.68)	-0.55	(-1.44, 0.34)
Up Low-Mid	1.34	(0.98, 1.83)	0.93	(0.66, 1.32)	2.49	(1.61, 3.84)**	0.94	(0.51, 1.72)	-0.20	(-1.57, 1.16)
Down High-Low	1.53	(1.12, 2.09)*	0.91	(0.63, 1.33)	2.24	(1.43, 3.51)**	0.94	(0.51, 1.75)	-0.96	(-2.16, 0.23)
Down Mid-Low	1.76	(1.39, 2.23)**	1.18	(0.91, 1.53)	2.60	(1.84, 3.69)**	1.22	(0.79, 1.88)	-1.07	(-1.98, -0.17)*
Stable Low	2.43	(1.88, 3.14)**	1.10	(0.82, 1.47)	3.49	(2.42, 5.04)**	1.34	(0.82, 2.18)	-1.31	(-2.34, -0.28)*
Gender										
Men	1		1		1		1		0	
Women	0.97	(0.85, 1.10)	0.82	(0.71, 0.95)*	1.32	(1.11, 1.58)*	0.91	(0.71, 1.14)	-15.98	(-16.49, -15.47)**
Age										
Continuous	1.02	(1.01, 1.03)**	0.98	(0.97, 0.99)**	1.09	(1.08, 1.10)**	1.01	(1.00, 1.02)	-0.42	(-0.44, -0.39)**
Education										
High degree	1		1		1		1		0	
Secondary qualif	1.38	(1.18, 1.62)**	1.01	(0.84, 1.22)	1.30	(1.02, 1.65)*	0.83	(0.62, 1.11)	-1.21	(-1.80, -0.63)**
No qualification	1.94	(1.62, 2.32)**	1.30	(1.05, 1.61)*	2.33	(1.82, 2.96)**	0.98	(0.70, 1.38)	-1.69	(-2.42, -0.96)**
Smoking										
Never smoker	1		1		1		1		0	
Ex-smoker	1.18	(1.03, 1.36)*	1.28	(1.09, 1.51)*	1.56	(1.28, 1.90)**	1.33	(1.02, 1.73)*	0.19	(-0.31, 0.70)
Smoker	1.80	(1.49, 2.17)**	1.79	(1.45, 2.21)**	3.25	(2.52, 4.19)**	1.97	(1.41, 2.74)**	-1.04	(-1.87, -0.21)*
Physical activity										
Active	1		1		1		1		0	
Non-active	3.02	(2.48, 3.69)**	2.15	(1.75, 2.65)**	1.36	(1.06, 1.74)*	1.99	(1.44, 2.74)**	-2.50	(-3.40, -1.61)**

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001*

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Reference table. Regression models between health and function and social trajectories adjusted for gender, age, education and behaviours **MODEL 4** **Imputed data analysis**

	Self-rated health Poor/fair		Self-rated oral health Poor/fair		Total tooth loss		Oral impacts on daily performance		Mean grip Strength	
	w3 n=8659 OR (95% C.I)								w4 n=9805 Coef (95% C.I)	
Social Trajectories										
Stable High	1		1		1		1		0	
Up Mid-High	1.09	(0.90, 1.32)	0.81	(0.65, 1.00)	1.24	(0.92, 1.66)	0.93	(0.65, 1.31)	-0.57	(-1.15, 0.00)
Up Low-High	1.32	(0.98, 1.78)	0.80	(0.56, 1.14)	2.27	(1.51, 3.42)**	1.18	(0.68, 2.06)	-0.65	(-1.66, 0.36)
Down High-Mid	1.08	(0.84, 1.40)	1.00	(0.76, 1.31)	1.06	(0.72, 1.56)	1.17	(0.74, 1.85)	-0.02	(-0.80, 0.73)
Stable Middle	1.23	(1.00, 1.51)*	0.97	(0.77, 1.23)	1.53	(1.13, 2.08)*	1.09	(0.74, 1.59)	-0.46	(-1.15, 0.22)
Up Low-Mid	1.57	(1.16, 2.13)*	1.02	(0.73, 1.44)	2.34	(1.55, 3.54)**	1.15	(0.66, 2.01)	-0.06	(-1.20, 1.07)
Down High-Low	1.76	(1.33, 2.29)**	1.14	(0.83, 1.56)	2.07	(1.43, 2.99)**	1.29	(0.78, 2.13)	-1.41	(-2.37, -0.44)*
Down Mid-Low	1.93	(1.59, 2.36)**	1.19	(0.96, 1.49)	2.66	(2.01, 3.53)**	1.30	(0.90, 1.86)	-1.41	(-2.10, -0.72)**
Stable Low	2.62	(2.08, 3.28)**	1.12	(0.86, 1.45)	3.50	(2.56, 4.79)**	1.25	(0.81, 1.91)	-1.81	(-2.69, -0.94)**
Gender										
Men	1		1		1		1		0	
Women	0.99	(0.89, 1.10)	0.86	(0.76, 0.97)*	1.28	(1.12, 1.47)**	1.02	(0.84, 1.23)	-15.91	(-16.29, -15.54)**
Age										
Continuous	1.02	(1.01, 1.02)**	0.99	(0.98, 0.99)**	1.09	(1.08, 1.10)**	1.01	(1.01, 1.02)*	-0.38	(-0.40, -0.36)**
Education										
High degree	1		1		1		1		0	
Secondary qualif	1.35	(1.18, 1.54)**	1.02	(0.88, 1.18)	1.24	(1.03, 1.50)*	0.80	(0.62, 1.02)	-1.18	(-1.63, -0.73)**
No qualification	1.79	(1.55, 2.06)**	1.34	(1.13, 1.58)*	1.95	(1.61, 2.36)**	1.01	(0.76, 1.33)	-1.56	(-2.09, -1.04)**
Smoking										
Never smoker	1		1		1		1		0	
Ex-smoker	1.20	(1.07, 1.34)*	1.26	(1.11, 1.44)*	1.58	(1.36, 1.85)**	1.20	(0.96, 1.49)	0.46	(0.07, 0.84)*
Smoker	1.78	(1.54, 2.07)**	1.90	(1.61, 2.24)**	3.34	(2.74, 4.06)**	1.91	(1.47, 2.49)**	-0.52	(-1.16, 0.12)
Physical activity										
Active	1		1		1		1		0	
Non-active	3.05	(2.61, 3.55)**	2.04	(1.74, 2.39)**	1.33	(1.11, 1.60)*	2.01	(1.57, 2.57)**	-3.05	(-3.68, -2.43)**

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001.*

Table 81. Full-adjusted regression between health and function and social trajectories **MODEL 5 Complete data analysis**

	Self-rated health		Self-rated oral health		Total tooth loss		Oral impacts on daily performance		Mean grip Strength	
	w3 n=5972 OR (95% C.I)								w4 n=4498 Coef (95% C.I)	
Social Trajectories										
Stable High	1		1		1		1		0	
Up Mid-High	1.05	(0.84, 1.32)	0.75	(0.58, 0.96)*	1.46	(1.03, 2.06)*	0.96	(0.65, 1.42)	-0.60	(-1.41, 0.20)
Up Low-High	1.11	(0.82, 1.51)	0.87	(0.62, 1.24)	2.27	(1.46, 3.53)**	1.40	(0.83, 2.34)	-0.99	(-2.09, 0.11)
Down High-Mid	1.07	(0.80, 1.44)	0.99	(0.70, 1.33)	1.05	(0.66, 1.66)	1.18	(0.72, 1.94)	0.15	(-0.87, 1.16)
Stable Middle	1.14	(0.89, 1.47)	0.93	(0.70, 1.23)	1.58	(1.09, 2.29)*	1.04	(0.67, 1.62)	-0.50	(-1.39, 0.39)
Up Low-Mid	1.27	(0.92, 1.76)	0.89	(0.63, 1.27)	2.44	(1.58, 3.76)**	0.87	(0.47, 1.60)	-0.01	(-1.36, 1.35)
Down High-Low	1.24	(0.90, 1.73)	0.80	(0.55, 1.17)	2.11	(1.35, 3.31)*	0.78	(0.43, 1.44)	-0.73	(-1.91, 0.45)
Down Mid-Low	1.58	(1.24, 2.01)**	1.07	(0.83, 1.39)	2.50	(1.76, 3.55)**	1.06	(0.69, 1.64)	-0.94	(-1.85, -0.03)*
Stable Low	2.23	(1.72, 2.91)**	1.00	(0.74, 1.34)	3.37	(2.33, 4.89)**	1.19	(0.73, 1.94)	-1.03	(-2.05, -0.02)*
Gender										
Men	1		1		1		1		0	
Women	0.80	(0.70, 0.92)*	0.77	(0.66, 0.90)*	1.27	(1.06, 1.53)*	0.81	(0.63, 1.03)	-15.73	(-16.25, -15.22)**
Age										
Continuous	1.00	(0.99, 1.01)	0.98	(0.97, 0.99)**	1.08	(1.07, 1.09)**	1.00	(0.99, 1.02)	-0.40	(-0.43, -0.36)**
Education										
High degree	1		1		1		1		0	
Secondary qualif	1.34	(1.14, 1.58)*	1.01	(0.84, 1.21)	1.28	(1.01, 1.63)*	0.80	(0.60, 1.08)	-1.16	(-1.75, -0.58)**
No qualification	1.86	(1.55, 1.23)**	1.30	(1.05, 1.61)*	2.29	(1.79, 2.91)**	0.96	(0.70, 1.35)	-1.57	(-2.29, -0.84)**
Smoking										
Never smoker	1		1		1		1		0	
Ex-smoker	1.19	(1.03, 1.38)*	1.29	(1.09, 1.52)*	1.56	(1.28, 1.90)**	1.32	(1.01, 1.72)*	0.20	(-0.31, 0.71)
Smoker	1.63	(1.34, 1.99)**	1.65	(1.33, 2.05)**	3.18	(2.46, 4.11)**	1.74	(1.24, 2.43)*	-0.78	(-1.61, 0.04)
Physical activity										
Active	1		1		1		1		0	
Non-active	2.81	(2.31, 3.43)**	2.04	(1.65, 2.53)**	1.33	(1.04, 1.70)*	1.84	(1.34, 2.52)**	-2.38	(-3.26, -1.51)**
Employment status										
Employed	1		1		1		1		0	
Retired	2.64	(2.18, 3.19)**	1.03	(0.84, 1.27)	1.37	(1.02, 1.82)*	1.45	(1.03, 2.04)*	-0.87	(-1.52, -0.21*
Other inactive	4.90	(3.96, 6.05)**	1.34	(1.07, 1.69)*	1.45	(1.05, 2.01)*	1.94	(1.35, 2.78)**	-2.47	(-3.42, -1.52)**
Marital status										
Married	1		1		1		1		0	
Single	1.26	(0.96, 1.65)	1.52	(1.14, 2.02)*	0.82	(0.54, 1.24)	0.94	(0.56, 1.56)	-1.53	(-2.59, -0.48)*
Separated	1.38	(1.13, 1.69)*	1.61	(1.30, 1.99)**	1.10	(0.83, 1.45)	1.74	(1.27, 2.39)*	-0.31	(-1.14, 0.51)
Widowed	1.14	(0.94, 1.38)	1.23	(0.98, 1.55)	1.08	(0.87, 1.35)	1.26	(0.89, 1.79)	-0.58	(-1.23, 0.07)
Chid health										
Good	1		1		1		1		0	
Poor	2.03	(1.69, 2.45)**	1.42	(1.15,1.76)*	1.17	(0.92, 1.50)	1.53	(1.12, 2.08)*	-0.64	(-1.41, 0.12)

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001*

Reference table Full-adjusted regression between health and function and social trajectories **MODEL 5** **Imputed data analysis**

	Self-rated health		Self-rated oral health		Total tooth loss		Oral impacts on daily performance		Mean grip Strength	
	w3 n=8659 OR (95% C.I)								w4 n=9805 Coef (95% C.I)	
Social Trajectories										
Stable High	1		1		1		1		0	
Up Mid-High	1.09	(0.90, 1.32)	0.81	(0.65, 1.01)	1.23	(0.92, 1.66)	0.92	(0.65, 1.30)	-0.53	(-1.10, 0.04)
Up Low-High	1.31	(0.97, 1.78)	0.78	(0.55, 1.12)	2.23	(1.48, 3.36)**	1.15	(0.66, 2.02)	-0.63	(-1.64, 0.37)
Down High-Mid	1.06	(0.81, 1.38)	0.93	(0.71, 1.23)	1.05	(0.71, 1.55)	1.12	(0.71, 1.78)	0.04	(-0.71, 0.79)
Stable Middle	1.21	(0.98, 1.49)	0.93	(0.74, 1.18)	1.51	(1.11, 2.04)*	1.05	(0.71, 1.53)	-0.38	(-1.06, 0.29)
Up Low-Mid	1.52	(1.10, 2.09)*	0.97	(0.69, 1.36)	2.30	(1.52, 3.48)**	1.07	(0.61, 1.89)	0.08	(-1.04, 1.20)
Down High-Low	1.50	(1.14, 1.97)*	1.00	(0.72, 1.38)	1.96	(1.35, 2.85)**	1.11	(0.67, 1.85)	-1.11	(-2.07, -0.14)*
Down Mid-Low	1.71	(1.40, 2.09)**	1.06	(0.85, 1.33)	2.55	(1.92, 3.39)**	1.16	(0.80, 1.68)	-1.16	(-1.86, -0.46)*
Stable Low	2.30	(1.82, 2.91)**	0.99	(0.76, 1.29)	3.35	(2.44, 4.60)**	1.10	(0.72, 1.69)	-1.44	(-2.31, -0.57)*
Gender										
Men	1		1		1		1		0	
Women	0.83	(0.75, 0.93)*	0.80	(0.71, 0.91)*	1.24	(1.07, 1.43)*	0.91	(0.75, 1.11)	-15.65	(-16.03, -15.26)**
Age										
Continuous	1.00	(1.00, 1.01)	0.99	(0.98, 1.00)*	1.08	(1.07, 1.09)**	1.01	(1.00, 1.02)	-0.35	(-0.38, -0.33)**
Education										
High degree	1		1		1		1		0	
Secondary qualif	1.31	(1.14, 1.50)**	1.03	(0.88, 1.19)	1.24	(1.02, 1.50)*	0.78	(0.61, 1.00)*	-1.10	(-1.54, -0.65)**
No qualification	1.68	(1.45, 1.95)**	1.36	(1.15, 1.61)*	1.92	(1.58, 2.34)**	0.97	(0.74, 1.27)	-1.35	(-1.88, -0.82)**
Smoking										
Never smoker	1		1		1		1		0	
Ex-smoker	1.21	(1.08, 1.36)*	1.27	(1.11, 1.45)**	1.58	(1.36, 1.84)**	1.19	(0.96, 1.49)	0.48	(0.09, 0.86)*
Smoker	1.65	(1.41, 1.93)**	1.76	(1.49, 2.09)**	3.31	(2.71, 4.04)**	1.74	(1.33, 2.28)**	-0.30	(-0.95, 0.34)
Physical activity										
Active	1		1		1		1		0	
Non-active	2.79	(2.39, 3.26)**	1.93	(1.64, 2.27)**	1.32	(1.10, 1.58)*	1.86	(1.45, 2.38)**	-2.79	(-3.41, -2.17)**
Employment status										
Employed	1		1		1		1		0	
Retired	2.30	(1.97, 2.68)**	0.88	(0.74, 1.04)	1.34	(1.07, 1.68)*	1.51	(1.15, 1.99)*	-1.38	(-1.86, -0.90)**
Other inactive	4.20	(3.55, 4.97)**	1.25	(1.04, 1.50)*	1.31	(1.01, 1.69)*	2.08	(1.55, 2.79)**	-2.80	(-3.49, -2.11)**
Marital status										
Married	1		1		1		1		0	
Single	1.30	(1.03, 1.63)*	1.38	(1.08, 1.77)*	1.03	(0.76, 1.41)	0.95	(0.61, 1.48)	-0.94	(-1.76, -0.11)*
Separated	1.58	(1.34, 1.87)**	1.85	(1.56, 2.21)**	1.03	(0.82, 1.30)	1.62	(1.23, 2.12)**	-0.48	(-1.12 0.15)
Widowed	1.14	(0.98, 1.34)	1.12	(0.93, 1.34)	1.15	(0.97, 1.37)	1.15	(0.87, 1.51)	-0.29	(-0.85, 0.27)
Chid health										
Good	1		1		1		1		0	
Poor	2.08	(1.76, 2.45)**	1.45	(1.21, 1.73)**	1.22	(0.98, 1.51)	1.42	(1.08, 1.87)*	-0.74	(-1.47, -0.02)*

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001*

Appendix H. Stratification of regression analyses

Table 82 to Table 85 display the estimates of the regression analyses used to test the association between self-rated general health, self-rated oral health, total tooth loss and grip strength with social mobility trajectories stratified by gender.

The tables included on this appendix show the estimates of the covariates included on the stratified full adjusted models. Generally, no considerably differences were found between men and women, with two exceptions. First, Table 82 and Table 85 show that employment status had a considerably higher effect on men than women on reporting poor general health and on have lower grip strength. Specifically, among men, comparing to the employed individuals, economically inactive individuals were 7.66 (95%CI 5.65, 10.38) times more likely to report poor general health and had 4.19 kg (95%CI -5.58, -2.80) lower grip strength; while among women, economically inactive women were 3.19 (95%CI 2.57, 3.96) times more likely to report poor health and had 1.72 kg (95%CI -2.43, -1.01) lower grip strength than their employed peers. Second, Table 84 shows that smoking status had a higher effect on men than women on reporting total tooth loss. Among men, compared to never smokers, those current smokers were 4.59 (95%CI 3.21, 6.56) times more likely to be tooth less; while among women, those current smokers were 2.87 (95%CI 2.24, 3.69) times more likely to report total tooth loss.

Table 82. Full adjusted regression models between social mobility and self-rated general health **stratified** by gender OR (95%CI)

	Men w3 n=3877		**Women** w3 n=4782	
	Prevalence poor health: 33.2%		Prevalence poor health: 34.0%	
Social trajectories				
Stable High	1		1	
Up Mid-High	1.11	(0.82, 1.49)	1.07	(0.82, 1.40)
Up Low-High	1.35	(0.86, 2.12)	1.26	(0.82, 1.92)
Down High-Mid	1.14	(0.76, 1.70)	0.99	(0.70, 1.40)
Stable Middle	1.37	(0.99, 1.86)	1.08	(0.80, 1.44)
Up Low-Mid	1.50	(0.95, 2.39)	1.46	(0.96, 2.23)
Down High-Low	1.32	(0.85, 2.06)	1.60	(1.13, 2.26)*
Down Mid-Low	1.55	(1.14, 2.10)*	1.82	(1.38, 2.41)**
Stable Low	2.13	(1.49, 3.05)**	2.38	(1.72, 3.28)**
Age				
Continuous	1.01	(1.00, 1.02)	1.00	(1.00, 1.01)
Education				
High degree	1		1	
Secondary qualif	1.43	(1.18, 1.75)**	1.20	(1.00, 1.46)
No qualification	1.84	(1.48, 2.28)**	1.57	(1.28, 1.92)**
Smoking				
Never smoker	1		1	
Ex-smoker	1.31	(1.09, 1.58)*	1.13	(0.97, 1.31)
Smoker	1.57	(1.22, 2.04)*	1.68	(1.38, 2.05)*
Physical activity				
Active	1		1	
Non-active	2.83	(2.29, 3.50)**	2.65	(2.10, 3.34)**
Employment status				
Employed	1		1	
Retired	2.33	(1.85, 2.94)**	2.11	(1.71, 2.60)**
Other inactive	7.66	(5.65, 10.38)**	3.19	(2.57, 3.96)**
Marital status				
Married	1		1	
Single	1.08	(0.77, 1.50)	1.53	(1.11, 2.12)*
Separated	1.44	(1.08, 1.92)*	1.62	(1.31, 2.00)**
Widowed	1.01	(0.77, 1.33)	1.20	(1.00, 1.46)
Childhood Health				
Good	1		1	
Poor	2.21	(1.72, 2.84)**	2.00	(1.61, 2.48)**

*Cross-sectional weighted values of imputed data; *p-value <0.05; ** p-value <0.001*

Table 83. Full adjusted regression models between social mobility and self-rated oral health stratified by gender OR (95%CI)

	Men w3 n=3877 Prevalence poor oral health: 20.6%		Women w3 n=4782 Prevalence poor oral health: 17.7%	
Social trajectories				
Stable High	1		1	
Up Mid-High	0.79	(0.58, 1.07)	0.85	(0.63, 1.14)
Up Low-High	0.88	(0.54, 1.43)	0.70	(0.42, 1.17)
Down High-Mid	1.14	(0.77, 1.70)	0.75	(0.51, 1.11)
Stable Middle	1.00	(0.71, 1.41)	0.86	(0.63, 1.19)
Up Low-Mid	1.10	(0.68, 1.78)	0.79	(0.48, 1.30)
Down High-Low	0.87	(0.51, 1.48)	1.05	(0.70, 1.57)
Down Mid-Low	1.11	(0.80, 1.53)	1.02	(0.75, 1.40)
Stable Low	0.98	(0.68, 1.42)	0.99	(0.68, 1.43)
Age				
Continuous	0.99	(0.98, 1.00)	0.99	(0.98, 1.01)
Education				
High degree	1		1	
Secondary qualif	0.94	(0.75, 1.17)	1.08	(0.88, 1.36)
No qualification	1.52	(1.20, 1.93)*	1.22	(0.96, 1.54)
Smoking				
Never smoker	1		1	
Ex-smoker	1.66	(1.34, 2.06)**	1.03	(0.86, 1.22)
Smoker	2.16	(1.65, 2.82)**	1.54	(1.23, 1.93)**
Physical activity				
Active	1		1	
Non-active	1.92	(1.54, 2.38)**	1.95	(1.52, 2.49)**
Employment status				
Employed	1		1	
Retired	0.91	(0.71, 1.17)	0.81	(0.63, 1.02)
Other inactive	1.44	(1.07, 1.95)*	1.10	(0.87, 1.39)
Marital status				
Married	1		1	
Single	1.59	(1.14, 2.22)*	1.10	(0.74, 1.63)
Separated	1.68	(1.27, 2.23)**	1.98	(1.58, 2.48)**
Widowed	1.04	(0.76, 1.43)	1.17	(0.93, 1.47)
Childhood Health				
Good	1		1	
Poor	1.46	(1.11, 1.91)*	1.45	(1.13, 1.85)*

*Cross-sectional weighted values of imputed data; *p-value <0.05; ** p-value <0.001*

Table 84. Full adjusted regression models between social mobility and total tooth loss **stratified** by gender OR (95%CI)

	Men w3 n=3877		**Women** w3 n=4782	
	Prevalence total tooth loss: 15.1%		Prevalence total tooth loss: 20.3%	
Social trajectories				
Stable High	1		1	
Up Mid-High	1.31	(0.83, 2.06)	1.21	(0.82, 1.78)
Up Low-High	2.98	(1.64, 5.43)**	1.72	(0.96, 3.07)
Down High-Mid	1.38	(0.76, 2.50)	0.87	(0.52, 1.43)
Stable Middle	1.85	(1.16, 2.94)*	1.29	(0.86, 1.93)
Up Low-Mid	2.66	(1.47, 4.80)*	2.05	(1.17, 3.61)*
Down High-Low	2.47	(1.28, 4.75)*	1.64	(1.02, 2.62)*
Down Mid-Low	2.76	(1.78, 4.27)**	2.35	(1.61, 3.43)**
Stable Low	4.00	(2.48, 6.47)**	2.88	(1.90, 4.37)**
Age				
Continuous	1.08	(1.07, 1.10)**	1.08	(1.07, 1.10)
Education				
High degree	1		1	
Secondary qualif	1.36	(1.04, 1.80)*	1.14	(0.87, 1.48)
No qualification	1.83	(1.37, 2.43)**	1.96	(1.50, 2.55)
Smoking				
Never smoker	1		1	
Ex-smoker	2.14	(1.60, 2.87)**	1.39	(1.15, 1.69)
Smoker	4.59	(3.21, 6.56)**	2.87	(2.24, 3.69)**
Physical activity				
Active	1		1	
Non-active	1.19	(0.92, 1.54)	1.47	(1.14, 1.90)**
Employment status				
Employed	1		1	
Retired	1.40	(0.99, 1.97)	1.30	(0.96, 1.76)
Other inactive	1.35	(0.87, 2.10)	1.24	(0.89, 1.71)
Marital status				
Married	1		1	
Single	1.23	(0.79, 1.90)	0.85	(0.55, 1.31)
Separated	1.05	(0.72, 1.54)	1.03	(0.77, 1.38)**
Widowed	1.00	(0.74, 1.35)	1.21	(0.97, 1.50)
Childhood Health				
Good	1		1	
Poor	1.11	(0.80, 1.55)	1.28	(0.98, 1.68)*

*Cross-sectional weighted values of imputed data; *p-value <0.05; ** p-value <0.001*

Table 85. Full adjusted regression models between social mobility and grip strength stratified by gender Coefficient (95%CI)

	Men w3 n=4398 Mean Grip Strength (SD): 39.8 (17.1)		Women w3 n=5407 Mean Grip Strength (SD): 23.1 (12.3)	
Social trajectories				
Stable High	0		0	
Up Mid-High	-0.17	(-1.09, 0.74)	-0.99	(-1.66, -0.32)*
Up Low-High	-0.02	(-1.58, 1.53)	-1.38	(-2.54, -0.22)*
Down High-Mid	0.70	(-0.69, 2.02)	-0.63	(-1.51, 0.25)
Stable Middle	-0.01	(-1.16, 1.15)	-0.81	(-1.59, -0.04)*
Up Low-Mid	1.08	(-0.82, 2.99)	-0.82	(-2.03, 0.39)
Down High-Low	-1.03	(-2.70, 0.63)	-1.34	(-2.38, -0.29)*
Down Mid-Low	-0.73	(-1.89, 0.43)	-1.60	(-2.42, -0.77)**
Stable Low	-1.21	(-2.61, 0.19)	-1.67	(-2.66, -0.69)*
Age				
Continuous	-0.45	(-0.49, -0.41)**	-0.30	(-0.33, -0.27)**
Education				
High degree	0		0	
Secondary qualif	-1.08	(-1.80, -0.35)*	-0.84	(-1.34, -0.33)*
No qualification	-1.74	(-2.58, -0.90)**	-1.04	(-1.66, -0.43)*
Smoking				
Never smoker	0		0	
Ex-smoker	0.89	(0.23, 1.55)*	0.32	(-0.12, 0.75)
Smoker	-0.76	(-1.77, 0.25)	0.40	(-0.35, 1.15)
Physical activity				
Active	0		0	
Non-active	-3.02	(-3.92, -2.12)**	-2.55	(-3.31, -1.79)**
Employment status				
Employed	0		0	
Retired	-1.37	(-2.15, -0.59)*	-0.58	(-1.16, -0.01)*
Other inactive	-4.19	(-5.58, -2.80)**	-1.72	(-2.43, -1.01)**
Marital status				
Married	0		0	
Single	-1.08	(-2.31, 0.15)	-0.84	(-1.84, 0.15)
Separated	-0.47	(-1.65, 0.71)	-0.34	(-1.06, 0.37)
Widowed	-1.22	(-2.24, -0.19)*	-0.47	(-1.09, 0.15)
Childhood Health				
Good	0		0	
Poor	-0.77	(-1.89, 0.34)	-0.76	(-1.52, -0.01)

*Cross-sectional weighted values of imputed data; *p-value <0.05; ** p-value <0.001*

Table 86 to Table 88 shows the estimates of the regression analyses examining the association between self-rated oral health, total tooth loss and grip strength with social mobility stratified by age group.

The effect of intergenerational social mobility trajectories on total tooth loss and grip strength was slightly higher in the youngest group compared with the the older groups. At younger age the association between social trajectories and total tooth loss was larger than at older ages. Furthermore, in most of the trajectories as the age increased the estimated odds ratio gradually decreased, implying a lower effect of social trajectories on total tooth loss at older ages.

Additionally, the stratified analysis revealed slight differences on the association between intergenerational social trajectories and grip strength by age group, comparing the youngest group with the oldest group, most of the estimates of the youngest group were higher, suggesting a higher effect of social trajectories on grip strength at younger age.

Table 86. Full adjusted regression models between social mobility and self-rated oral health **stratified** by age group OR (95%CI)

	Age group: **50-64** w3 n=4363 Prevalence poor oral health: 20.2%		Age group: **65-74** w3 n=2301 Prevalence poor oral health: 17.7%		Age group: **74+** w3 n=1995 Prevalence poor oral health: 17.8%	
Social trajectories						
Stable High	1		1		1	
Up Mid-High	0.78	(0.59, 1.04)	0.92	(0.58, 1.45)	0.79	(0.45, 1.37)
Up Low-High	0.83	(0.53, 1.31)	0.70	(0.31, 1.58)	0.70	(0.29, 1.71)
Down High-Mid	0.91	(0.63, 1.31)	0.93	(0.52, 1.68)	1.00	(0.53, 1.90)
Stable Middle	0.83	(0.61, 1.14)	1.20	(0.75, 1.90)	1.00	(0.57, 1.74)
Up Low-Mid	0.88	(0.56, 1.37)	1.04	(0.52, 2.09)	1.14	(0.48, 2.70)
Down High-Low	1.06	(0.70, 1.62)	0.80	(0.40, 1.61)	1.11	(0.54, 2.28)
Down Mid-Low	1.04	(0.77, 1.41)	1.23	(0.79, 1.93)	1.06	(0.63, 1.79)
Stable Low	0.92	(0.64, 1.33)	1.26	(0.73, 2.18)	0.95	(0.53, 1.70)
Age						
Continuous	0.81	(0.68, 0.96)*	0.82	(0.64, 1.05)	0.65	(0.49, 0.87)*
Education						
High degree	1		1		1	
Secondary qualif	1.13	(0.93, 1.38)	0.84	(0.61, 1.15)	0.83	(0.57, 1.20)
No qualification	1.56	(1.23, 1.98)**	1.22	(0.89, 1.69)	1.03	(0.71, 1.49)
Smoking						
Never smoker	1		1		1	
Ex-smoker	1.46	(1.21, 1.77)**	1.15	(0.90, 1.48)	0.92	(0.69, 1.22)
Smoker	2.28	(1.83, 2.84)**	1.14	(0.80, 1.64)	1.05	(0.66, 1.69)
Physical activity						
Active	1		1		1	
Non-active	1.54	(1.18, 2.01)*	2.23	(1.64, 3.02)**	2.24	(1.71, 2.94)**
Employment status						
Employed	1		1		1	
Retired	0.87	(0.70, 1.09)	0.96	(0.62, 1.47)	0.81	(0.28, 2.30)
Other inactive	1.31	(1.06, 1.62)*	0.97	(0.55, 1.68)	1.23	(0.41, 3.68)
Marital status						
Married	1		1		1	
Single	1.32	(0.96, 1.83)	1.18	(0.68, 2.03)	2.07	(1.18, 3.66)*
Separated	1.71	(1.36, 2.15)**	1.96	(1.39, 2.74)**	1.98	(1.16, 3.37)*
Widowed	0.93	(0.62, 1.40)	0.89	(0.63, 1.26)	1.51	(1.13, 3.03)*
Childhood Health						
Good	1		1		1	
Poor	1.42	(1.10, 1.83)*	1.65	(1.17, 2.34)*	1.30	(0.86, 1.95)

*Cross-sectional weighted values of imputed data; *p-value <0.05; ** p-value <0.001*

Table 87. Full adjusted regression models between social mobility and total tooth loss stratified by age group OR (95%CI)

	Age group: 50-64 w3 n=4363 Total tooth loss: 6.8%		Age group: 65-74 w3 n=2301 Total tooth loss: 19.8%		Age group: 74+ w3 n=1995 Total tooth loss: 40.9%	
Social trajectories						
Stable High	1		1		1	
Up Mid-High	1.15	(0.60, 2.19)	1.74	(1.05, 2.88)*	0.95	(0.61, 1.49)
Up Low-High	2.49	(1.11, 5.57)*	1.83	(0.87, 3.86)	2.52	(1.28, 4.98)*
Down High-Mid	0.80	(0.33, 1.96)	1.36	(0.72, 2.59)	1.09	(0.62, 1.89)
Stable Middle	1.82	(0.99, 3.36)*	1.71	(1.02, 2.87)*	1.17	(0.72, 1.88)
Up Low-Mid	2.76	(1.36, 5.59)*	2.01	(0.99, 4.10)*	1.94	(1.00, 3.77)
Down High-Low	2.51	(1.22, 5.16)*	1.96	(1.04, 3.70)*	1.58	(0.88, 2.84)
Down Mid-Low	2.55	(1.42, 4.58)*	2.61	(1.59, 4.28)**	2.29	(1.46, 3.60)**
Stable Low	3.17	(1.70, 5.91)**	3.26	(1.87, 5.70)**	3.19	(1.94, 5.24)**
Gender						
Men	1		1		1	
Women	1.05	(0.80, 1.38)	1.17	(0.91, 1.50)	1.46	(1.15, 1.85)*
Education						
High degree	1		1		1	
Secondary qualif	1.67	(1.17, 2.40)*	1.33	(0.97, 1.83)	0.93	(0.67, 1.29)
No qualification	2.54	(1.72, 3.75)**	1.82	(1.32,2.51)**	1.67	(1.22, 2.29)*
Smoking						
Never smoker	1		1		1	
Ex-smoker	1.96	(1.38, 2.78)**	1.64	(1.26, 2.14)**	1.42	(1.13, 1.79)*
Smoker	3.50	(2.45, 5.01)**	3.12	(2.22, 4.39)**	2.95	(1.96, 4.43)**
Physical activity						
Active	1		1		1	
Non-active	1.33	(0.89, 1.99)	1.39	(1.01, 1.92)*	1.76	(1.38, 2.25)**
Employment status						
Employed	1		1		1	
Retired	1.52	(1.09, 2.11)*	1.24	(0.76, 2.02)	2.08	(0.61, 7.10)
Other inactive	1.38	(1.00, 1.91)	1.37	(0.76, 2.47)	1.65	(0.47, 5.85)
Marital status						
Married	1		1		1	
Single	1.41	(0.85, 2.32)	0.97	(0.57, 1.64)	0.84	(0.50, 1.41)
Separated	1.18	(0.83, 1.69)	0.91	(0.62, 1.33)	0.93	(0.57, 1.51)
Widowed	1.09	(0.65, 1.84)	1.26	(0.93, 1.70)	1..39	(1.10, 1.75)*
Childhood Health						
Good	1		1		1	
Poor	1.07	(0.71, 1.63)	1.32	(0.94, 1.85)	1.18	(0.82, 1.68)

*Cross-sectional weighted values of imputed data; *p-value <0.05; ** p-value <0.001*

Table 88. Full adjusted regression models between social mobility and grip strength stratified by age group
Coefficient (95%CI)

	Age group: 50-64 w3 n=4363 Mean Grip Strength (SD): 34.7 (16.6)		Age group: 65-74 w3 n=2301 Mean Grip Strength (SD): 29.9 (19.5)		Age group: 74+ w3 n=1995 Mean Grip Strength (SD): 22.8 (23.3)	
Social trajectories						
Stable High	0		0		0	
Up Mid-High	-0.45	(-1.24, 0.35)	-0.39	(-1.43, 0.64)	-0.94	(-2.41, 0.54)
Up Low-High	-0.78	(-2.16, 0.59)	-0.45	(-2.12, 1.23)	-0.60	(-2.99, 1.79)
Down High-Mid	0.03	(-1.06, 1.11)	-0.11	(-1.49, 1.27)	-0.58	(-2.43, 1.27)
Stable Middle	-0.20	(-1.12, 0.73)	-0.91	(-2.13, 0.31)	-0.63	(-2.19, 0.93)
Up Low-Mid	0.07	(-1.53, 1.67)	0.28	(-1.55, 2.11)	0.04	(-2.29, 2.36)
Down High-Low	-1.40	(-2.82, 0.02)	-1.44	(-3.01, 0.13)	-0.77	(-2.78, 1.24)
Down Mid-Low	-1.12	(-2.14, -0.09)*	-1.73	(-2.91, -0.55)*	-0.79	(-2.45, 0.87)
Stable Low	-1.59	(-2.93, -0.25)*	-1.44	(-2.94, 0.06)	-0.85	(-2.69, 0.98)
Gender						
Men	0		0		0	
Women	-16.86	(-17.39, -16.32)**	-14.79	(-15.45, -14.13)**	-13.07	(-13.96, -12.18)**
Education						
High degree	0		0		0	
Secondary qualif	-0.87	(-1.49, -0.25)*	-1.23	(-2.02, -0.44)*	-1.55	(-2.63, -0.46)
No qualification	-1.64	(-2.47, -0.81)**	-1.55	(-2.44, -0.67)*	-1.71	(-2.82, -0.60)*
Smoking						
Never smoker	0		0		0	
Ex-smoker	0.57	(0.00, 1.13)*	0.52	(-0.12, 1.16)	0.20	(-0.60, 0.99)*
Smoker	-0.01	(-0.83, 0.83)	0.03	(-1.04, 1.10)	0.17	(-1.37, 1.71)**
Physical activity						
Active	0		0		0	
Non-active	-3.15	(-4.22, -2.08)**	-2.90	(-3.98, -1.81)**	-3.19	(-4.18, -2.20)**
Employment status						
Employed	0		0		0	
Retired	-2.30	(-2.91, -1.69)**	-2.30	(-3.31, -1.29)**	-0.65	(-2.95, 1.65)
Other inactive	-3.02	(-3.86, -2.19)**	-3.32	(-4.91, -1.74)**	-1.68	(-4.28, 0.92)
Marital status						
Married	0		0		0	
Single	-0.38	(-1.44, 0.68)	-1.45	(-3.14, 0.24)	-2.94	(-4.83, -1.04)
Separated	-0.56	(-1.39, 0.26)	-0.71	(-1.79, 0.38)	0.71	(-1.31, 2.73)
Widowed	-1.23	(-2.43, -0.03)*	-0.60	(-1.46, 0.26)	-2.08	(-3.01, -1.15)*
Childhood Health						
Good	0		0		0	
Poor	-1.01	(-2.09, 0.06)	-0.62	(-1.65, 0.42)	-0.56	(-1.69, 0.56)

*Cross-sectional weighted values of imputed data; *p-value <0.05; ** p-value <0.001*

Table 89 shows the estimated interactions terms between social trajectories and age (treated in its continuous form). Suggesting no statistical significant interaction between social trajectories and age. In other words, there is no statistical evidence a different association between adult health/function and social trajectories by age.

Table 89. Interaction term between social trajectories and continuous age

	Self-rated health Poor/fair		Self-rated oral health Poor/fair		Edentulousness		Oral impacts on daily performance		Mean grip Strength	
	w3 n=8659 OR (95% C.I)								w4 n=9805 Coef (95% C.I)	
Stable High	1		1		1		1		0	
Up Mid-High	1.00	(0.98, 1.02)	1.00	(0.97, 1.02)	0.98	(0.95, 1.01)	0.98	(0.95, 1.02)	-0.07	(-0.15, 0.01)
Down High-Mid	1.02	(0.98, 1.05)	1.00	(0.97, 1.04)	0.97	(0.93, 1.01)	1.00	(0.96, 1.04)	0.01	(-0.10, 0.12)
Up Low-High	1.00	(0.97, 1.02)	0.99	(0.96, 1.02)	0.97	(0.94, 1.01)	0.99	(0.95, 1.03)	-0.05	(-0.15, 0.05)
Stable Middle	0.99	(0.97, 1.01)	0.99	(0.97, 1.02)	0.98	(0.94, 1.01)	0.97	(0.93, 1.01)	-0.10	(-0.19, -0.01)
Up Low-Mid	0.98	(0.95, 1.01)	0.98	(0.94, 1.02)	0.97	(0.93, 1.01)	0.97	(0.93, 1.02)	-0.04	(-0.16, 0.09)
Down High-Low	0.98	(0.95, 1.01)	1.00	(0.97, 1.02)	0.97	(0.93, 1.01)	0.98	(0.93, 1.04)	-0.01	(-0.13, 0.11)
Down Mid-low	1.00	(0.98, 1.02)	1.00	(0.97, 1.02)	0.99	(0.96, 1.02)	0.97	(0.94, 1.01)	-0.09	(-0.18, -0.01)
Stable Low	0.99	(0.97, 1.01)	0.98	(0.95, 1.01)	0.99	(0.96, 1.03)	0.97	(0.94, 1.01)	-0.04	(-0.13, 0.06)

*All values are cross-sectional weighted; *p-value <0.05; ** p-value <0.001*

Appendix I. Structural equation modelling additional tables

Table 90 displays the root mean square error of approximation (RMSEA) and the comparative fit index (CFI). A RMSEA value of 0.05 or lower and a CFI value of 0.95 or higher were defined to indicate a good fitting model. All SEM models of this study had an excellent fit to the data.

This table additionally, shows the R-squared coefficient indicating the proportion of the variance of the outcomes and adult SEP explained by the rest of the variables within the models. Adding education to the model improved significantly the R-squared of the outcome and the adult SEP. Although, the increased on self-rated oral health and oral impacts were modest. Also, this table is showing that the R-squared also increased with the addition of health-related behaviours –smoking and physical activity-. Overall, the final models including smoking (Model 3.1) accounted for about 36% of the variance of adult SEP 13.9% of the variance of self-rated adult general health, 4.0% of the variance of adult self-rated oral health, 20.3% of the variance of adult total tooth loss, 2.6% of the variance of at least one oral impact on daily performance and 11.0% of the variance of adult grip strength. Generally, the inclusion of physical activity instead of smoking status improved the R-squares. Model 3.2 including physical activity accounted for about 36% of the variance of adult SEP 25% of the variance of self-rated adult general health, 5.7% of the variance of adult self-rated oral health, 22.1% of the variance of adult total tooth loss, 5.1% of the variance of at least one oral impact on daily performance and 10.9% of the variance of adult grip strength.

Table 90. SEM fit of the models and R-squared for adult SEP and adult health, oral health and physical function

		RMSEA	CFI	R-squared (%)	
				Outcome	Adult SEP
Self-rated health	Model 1	0.000	1.000	5.0	9.3
	Model 2: M1+education	0.000	1.000	12.6	36.4
	Model 3.1: M2+smoking	0.003	1.000	13.9	36.4
	Model 3.2: M2+p. activity	0.035	0.998	25.0	36.4
Self-rated oral health	Model 1	0.000	1.000	0.7	9.3
	Model 2: M1+education	0.000	1.000	1.6	36.4
	Model 3.1: M2+smoking	0.003	1.000	4.0	36.4
	Model 3.2: M2+p. activity	0.035	0.997	5.7	36.4
Total tooth loss	Model 1	0.000	1.000	4.2	9.3
	Model 2: M1+education	0.000	1.000	18.3	36.4
	Model 3.1: M2+smoking	0.003	1.000	20.3	36.4
	Model 3.2: M2+p. activity	0.035	0.998	22.1	36.4
Oral impacts on daily performance	Model 1	0.000	1.000	0.6	9.3
	Model 2: M1+education	0.000	1.000	1.1	36.4
	Model 3.1: M2+smoking	0.003	1.000	2.6	36.4
	Model 3.2: M2+p. activity	0.035	0.997	5.1	36.4
Grip strength	Model 1	0.000	1.000	0.5	8.3
	Model 2: M1+education	0.000	1.000	9.9	35.4
	Model 3.1: M2+smoking	0.022	0.999	11.0	35.4
	Model 3.2: M2+p. activity	0.015	0.999	10.9	35.4
Grip strength Strata: Men	Model 1	0.000	1.000	0.8	9.3
	Model 2: M1+education	0.000	1.000	6.9	33.4
	Model 3.1: M2+smoking	0.009	1.000	6.9	33.4
	Model 3.2: M2+p. activity	0.015	0.999	12.0	33.4
Grip strength Strata: Women	Model 1	0.000	1.000	1.2	7.7
	Model 2: M1+education	0.000	1.000	7.2	36.5
	Model 3.1: M2+smoking	0.010	1.000	7.6	36.5
	Model 3.2: M2+p. activity	0.027	0.982	16.3	36.5

Table 91 to Table 97 show the standardize estimates and p-values of the structural equation models testing the direct and indirect effect of childhood SEP and health on adult SEP and health/function.

Table 91. SEM analysis standardized estimates, their standard errors and significance; self-rated general health

Path	Estimate	S.E.	*p*-value
Model 1			
Child SEP→Adult SEP	.300	.013	<0.001
Child SEP→Adult health	.155	.015	<0.001
Child health→Adult SEP	.045	.014	.002
Child health→Adult health	.158	.014	<0.001
Adult SEP←→Adult health	.267	.016	<0.001
Child SEP←→Child health	.018	.014	.223
Model 2			
Child SEP→Adult SEP	.137	.013	<0.001
Child SEP→Adult health	.069	.016	<0.001
Child SEP→Education	.299	.013	<0.001
Child health→Adult SEP	.031	.013	.012
Child health→Adult health	.151	.014	<0.001
Child health→Education	.024	.014	.073
Education→Adult SEP	.546	.011	<0.001
Education→Adult health	.288	.016	<0.001
Adult SEP←→Adult health	.141	.018	<0.001
Child SEP←→Child health	.018	.014	.223
Model 3.1			
Child SEP→Adult SEP	.137	.013	<0.001
Child SEP→Adult health	.063	.016	<0.001
Child SEP→Education	.299	.013	<0.001
Child SEP→Smoking	.037	.015	.011
Child health→Adult SEP	.031	.013	.015
Child health→Adult health	.151	.014	<0.001
Child health→Education	.024	.014	.077
Education→Adult SEP	.546	.011	<0.001
Education→Adult health	.278	.016	<0.001
Education→Smoking	.035	.019	.063
Adult SEP→Smoking	.119	.019	<0.001
Smoking→Adult health	.108	.015	<0.001
Adult SEP←→Adult health	.131	.018	<0.001
Child SEP←→Child health	.017	.014	.230
Model 3.2			
Child SEP→Adult SEP	.138	.013	<0.001
Child SEP→Adult health	.072	.017	<0.001
Child SEP→Education	.298	.013	<0.001
Child SEP→Physical activity	-.017	.022	.432
Child health→Adult SEP	.030	.013	.017
Child health→Adult health	.149	.014	<0.001
Child health→Education	.030	.014	.030
Education→Adult SEP	.546	.011	<0.001
Education→Adult health	.203	.017	<0.001
Education→ Physical activity	.206	.026	<0.001
Adult SEP→ Physical activity	.062	.027	.021
Physical activity →Adult health	.357	.020	<0.001
Adult SEP←→Adult health	.131	.019	<0.001
Child SEP←→Child health	.017	.014	.234

Table 92. SEM analysis standardized estimates, their standard errors and significance; self-rated oral health

Path	Estimate	S.E.	*p*-value
Model 1			
Child SEP→Adult SEP	.300	.013	<0.001
Child SEP→Adult oral health	.033	.017	.051
Child health→Adult SEP	.045	.014	.002
Child health→Adult oral health	.074	.017	<0.001
Adult SEP←→Adult oral health	.118	.018	<0.001
Child SEP←→Child health	.018	.014	.223
Model 2			
Child SEP→Adult SEP	.137	.013	<0.001
Child SEP→Adult oral health	.003	.018	.863
Child SEP→Education	.298	.013	<0.001
Child health→Adult SEP	.031	.013	.012
Child health→Adult oral health	.072	.017	<0.001
Child health→Education	.024	.014	.074
Education→Adult SEP	.546	.011	<0.001
Education→Adult oral health	.101	.019	<0.001
Adult SEP←→Adult oral health	.079	.020	<0.001
Child SEP←→Child health	.018	.014	.223
Model 3.1			
Child SEP→Adult SEP	.137	.013	<0.001
Child SEP→Adult oral health	-.005	.018	.779
Child SEP→Education	.299	.013	<0.001
Child SEP→Smoking	.037	.015	.011
Child health→Adult SEP	.031	.013	.015
Child health→Adult oral health	.071	.017	<0.001
Child health→Education	.024	.014	.077
Education→Adult SEP	.546	.011	<0.001
Education→Adult oral health	.086	.019	<0.001
Education→Smoking	.035	.019	.063
Adult SEP→Smoking	.119	.019	<0.001
Smoking→Adult oral health	.151	.017	<0.001
Adult SEP←→Adult oral health	.065	.020	.001
Child SEP←→Child health	.017	.014	.230
Model 3.2			
Child SEP→Adult SEP	.137	.013	<0.001
Child SEP→Adult oral health	.005	.005	.792
Child SEP→Education	.298	.013	<0.001
Child SEP→Physical activity	-.017	.022	.432
Child health→Adult SEP	.030	.013	.016
Child health→Adult oral health	.071	.017	<0.001
Child health→Education	.030	.014	.030
Education→Adult SEP	.546	.011	<0.001
Education→Adult oral health	.052	.020	.009
Education→ Physical activity	.206	.026	<0.001
Adult SEP→ Physical activity	.062	.027	.021
Physical activity →Adult oral health	.205	.024	<0.001
Adult SEP←→Adult oral health	.070	.020	.001
Child SEP←→Child health	.017	.014	.234

Table 93. SEM analysis standardized estimates, their standard errors and significance; total tooth loss

Path	Estimate	S.E.	*p*-value
Model 1			
Child SEP→Adult SEP	.300	.013	<0.001
Child SEP→Adult tooth loss	.197	.019	<0.001
Child health→Adult SEP	.045	.014	.002
Child health→Adult tooth loss	.052	.018	.003
Adult SEP←→Adult tooth loss	.307	.018	<0.001
Child SEP←→Child health	.018	.014	.223
Model 2			
Child SEP→Adult SEP	.137	.013	<0.001
Child SEP→Adult tooth loss	.079	.020	<0.001
Child SEP→Education	.299	.013	<0.001
Child health→Adult SEP	.031	.013	.012
Child health→Adult tooth loss	.043	.017	.012
Child health→Education	.024	.014	.074
Education→Adult SEP	.546	.011	<0.001
Education→Adult tooth loss	.393	.017	<0.001
Adult SEP←→Adult tooth loss	.126	.020	<0.001
Child SEP←→Child health	.018	.014	.223
Model 3.1			
Child SEP→Adult SEP	.137	.013	<0.001
Child SEP→Adult tooth loss	.072	.020	<0.001
Child SEP→Education	.298	.013	<0.001
Child SEP→Smoking	.037	.015	.011
Child health→Adult SEP	.030	.013	.015
Child health→Adult tooth loss	.042	.017	.013
Child health→Education	.024	.014	.077
Education→Adult SEP	.546	.011	<0.001
Education→Adult tooth loss	.380	.017	<0.001
Education→Smoking	.035	.019	.063
Adult SEP→Smoking	.119	.019	<0.001
Smoking→Adult tooth loss	.133	.018	<0.001
Adult SEP←→Adult tooth loss	.114	.021	<0.001
Child SEP←→Child health	.017	.014	.230
Model 3.2			
Child SEP→Adult SEP	.137	.013	<0.001
Child SEP→Adult tooth loss	.081	.019	<0.001
Child SEP→Education	.298	.013	<0.001
Child SEP→Physical activity	-.017	.022	.434
Child health→Adult SEP	.030	.013	.017
Child health→Adult tooth loss	.040	.017	.018
Child health→Education	.030	.014	.030
Education→Adult SEP	.546	.011	<0.001
Education→Adult tooth loss	.347	.018	<0.001
Education→ Physical activity	.206	.026	<0.001
Adult SEP→ Physical activity	.062	.027	.021
Physical activity →Adult tooth loss	.195	.023	<0.001
Adult SEP←→Adult tooth loss	.118	.021	<0.001
Child SEP←→Child health	.017	.014	.234

Table 94. SEM analysis standardized estimates, their standard errors and significance; oral impacts on daily performance (OIDP)

Path	Estimate	S.E,	*p*-value
Model 1			
Child SEP→Adult SEP	.300	.013	<0.001
Child SEP→Adult OIDP	.024	.023	.303
Child health→Adult SEP	.045	.014	.002
Child health→Adult OIDP	.073	.020	<0.001
Adult SEP←→Adult OIDP	.093	.025	<0.001
Child SEP←→Child health	.018	.014	.223
Model 2			
Child SEP→Adult SEP	.137	.013	<0.001
Child SEP→Adult OIDP	.003	.025	.913
Child SEP→Education	.298	.013	<0.001
Child health→Adult SEP	.031	.013	.013
Child health→Adult OIDP	.071	.020	<0.001
Child health→Education	.024	.014	.074
Education→Adult SEP	.546	.011	<0.001
Education→Adult OIDP	.072	.025	.004
Adult SEP←→Adult OIDP	.067	.028	.016
Child SEP←→Child health	.018	.014	.223
Model 3.1			
Child SEP→Adult SEP	.137	.013	<0.001
Child SEP→Adult OIDP	-.004	.025	.879
Child SEP→Education	.298	.013	<0.001
Child SEP→Smoking	.037	.015	.011
Child health→Adult SEP	.030	.013	.016
Child health→Adult OIDP	.070	.020	.001
Child health→Education	.024	.014	.077
Education→Adult SEP	.546	.011	<0.001
Education→Adult OIDP	.060	.025	.018
Education→Smoking	.035	.019	.063
Adult SEP→Smoking	.119	.019	<0.001
Smoking→Adult OIDP	.121	.024	<0.001
Adult SEP←→Adult OIDP	.056	.028	.045
Child SEP←→Child health	.017	.014	.230
Model 3.2			
Child SEP→Adult SEP	.137	.013	<0.001
Child SEP→Adult OIDP	.004	.025	.860
Child SEP→Education	.298	.013	<0.001
Child SEP→Physical activity	-.017	.022	.434
Child health→Adult SEP	.030	.013	.017
Child health→Adult OIDP	.070	.020	.001
Child health→Education	.030	.014	.030
Education→Adult SEP	.546	.011	<0.001
Education→Adult OIDP	.023	.027	.390
Education→ Physical activity	.206	.026	<0.001
Adult SEP→ Physical activity	.062	.027	.021
Physical activity →Adult OIDP	.203	.033	<0.001
Adult SEP←→Adult OIDP	.058	.028	<0.001
Child SEP←→Child health	.017	.014	.234

Table 95. SEM analysis standardized estimates, their standard errors and significance; grip strength

Path	Estimate	S.E.	*p*-value
Model 1			
Child SEP→Adult SEP	.284	.012	<0.001
Child SEP→Adult grip strength	-.051	.012	<0.001
Child health→Adult SEP	.043	.015	.004
Child health→Adult grip strength	-.049	.013	<0.001
Adult SEP←→Adult grip strength	-.174	.012	<0.001
Child SEP←→Child health	.029	.016	.072
Model 2			
Child SEP→Adult SEP	.113	.013	<0.001
Child SEP→Adult grip strength	.049	.013	<0.001
Child SEP→Education	.311	.012	<0.001
Child health→Adult SEP	.035	.013	.006
Child health→Adult grip strength	-.045	.013	.001
Child health→Education	.014	.014	.333
Education→Adult SEP	.548	.011	<0.001
Education→Adult grip strength	-.322	.012	<0.001
Adult SEP←→Adult grip strength	-.009	.013	.517
Child SEP←→Child health	.029	.016	.073
Model 3.1			
Child SEP→Adult SEP	.113	.013	<0.001
Child SEP→Adult grip strength	.042	.013	.001
Child SEP→Education	.311	.012	<0.001
Child SEP→Smoking	.052	.014	<0.001
Child health→Adult SEP	.034	.013	.010
Child health→Adult grip strength	-.046	.013	<0.001
Child health→Education	.013	.014	.367
Education→Adult SEP	.548	.011	<0.001
Education→Adult grip strength	-.335	.012	<0.001
Education→Smoking	.048	.018	.007
Adult SEP→Smoking	.120	.018	<0.001
Smoking→Adult grip strength	.106	.012	<0.001
Adult SEP←→Adult grip strength	-.019	.014	.155
Child SEP←→Child health	.029	.016	.080
Model 3.2			
Child SEP→Adult SEP	.113	.013	<0.001
Child SEP→Adult grip strength	.052	.013	<0.001
Child SEP→Education	.311	.012	<0.001
Child SEP→Physical activity	.018	.020	.375
Child health→Adult SEP	.035	.013	.007
Child health→Adult grip strength	-.044	.013	.001
Child health→Education	.017	.014	.236
Education→Adult SEP	.548	.011	<0.001
Education→Adult grip strength	-.301	.012	<0.001
Education→ Physical activity	.174	.025	<0.001
Adult SEP→ Physical activity	.060	.025	.017
Physical activity →Adult grip strength	-.104	.016	<0.001
Adult SEP←→Adult grip strength	-.003	.014	.801
Child SEP←→Child health	.030	.016	.070

Table 96. SEM analysis standardized estimates, their standard errors and significance; grip strength: Men

Path	Estimate	S.E.	*p*-value
Model 1			
Child SEP→Adult SEP	.301	.018	<0.001
Child SEP→Adult grip strength	-.077	.018	<0.001
Child health→Adult SEP	.040	.023	.078
Child health→Adult grip strength	-.046	.020	.022
Adult SEP←→Adult grip strength	-.155	.019	<0.001
Child SEP←→Child health	.034	.021	.115
Model 2			
Child SEP→Adult SEP	.143	.018	<0.001
Child SEP→Adult grip strength	.003	.019	.895
Child SEP→Education	.306	.019	<0.001
Child health→Adult SEP	.036	.021	.078
Child health→Adult grip strength	-.044	.021	.036
Child health→Education	.008	.021	.700
Education→Adult SEP	.516	.017	<0.001
Education→Adult grip strength	-.259	.018	<0.001
Adult SEP←→Adult grip strength	-.032	.021	.120
Child SEP←→Child health	.034	.021	.115
Model 3.1			
Child SEP→Adult SEP	.143	.018	<0.001
Child SEP→Adult grip strength	.003	.019	.865
Child SEP→Education	.306	.019	<0.001
Child SEP→Smoking	.043	.020	.030
Child health→Adult SEP	.035	.021	.088
Child health→Adult grip strength	-.044	.021	.034
Child health→Education	.006	.021	.778
Education→Adult SEP	.516	.017	<0.001
Education→Adult grip strength	-.257	.018	<0.001
Education→Smoking	.132	.026	<0.001
Adult SEP→Smoking	.131	.026	<0.001
Smoking→Adult grip strength	-.011	.018	.544
Adult SEP←→Adult grip strength	-.031	.021	.135
Child SEP←→Child health	.033	.021	.122
Model 3.2			
Child SEP→Adult SEP	.143	.018	<0.001
Child SEP→Adult grip strength	.008	.019	.673
Child SEP→Education	.306	.019	<0.001
Child SEP→Physical activity	.010	.030	.734
Child health→Adult SEP	.036	.021	.079
Child health→Adult grip strength	-.042	.021	.041
Child health→Education	.011	.021	.598
Education→Adult SEP	.515	.017	<0.001
Education→Adult grip strength	-.208	.019	<0.001
Education→ Physical activity	.176	.035	<0.001
Adult SEP→ Physical activity	.092	.036	.010
Physical activity →Adult grip strength	-.229	.023	<0.001
Adult SEP←→Adult grip strength	-.015	.022	.495
Child SEP←→Child health	.034	.021	.114

Table 97. SEM analysis standardized estimates, their standard errors and significance; grip strength: Women

Path	Estimate	S.E.	*p*-value
Model 1			
Child SEP→Adult SEP	.273	.017	<0.001
Child SEP→Adult grip strength	-.091	.017	<0.001
Child health→Adult SEP	.042	.019	.029
Child health→Adult grip strength	-.053	.017	.002
Adult SEP←→Adult grip strength	-.170	.018	<0.001
Child SEP←→Child health	.027	.020	.178
Model 2			
Child SEP→Adult SEP	.087	.017	<0.001
Child SEP→Adult grip strength	-.006	.019	.771
Child SEP→Education	.328	.016	<0.001
Child health→Adult SEP	.035	.016	.033
Child health→Adult grip strength	-.050	.017	.003
Child health→Education	.012	.018	.506
Education→Adult SEP	.568	.014	<0.001
Education→Adult grip strength	-.260	.018	<0.001
Adult SEP←→Adult grip strength	-.040	.019	.035
Child SEP←→Child health	.027	.020	.178
Model 3.1			
Child SEP→Adult SEP	.087	.017	<0.001
Child SEP→Adult grip strength	-.009	.019	.634
Child SEP→Education	.328	.016	<0.001
Child SEP→Smoking	.042	.019	.029
Child health→Adult SEP	.033	.016	.041
Child health→Adult grip strength	-.050	.017	.003
Child health→Education	.011	.018	.529
Education→Adult SEP	.568	.014	<0.001
Education→Adult grip strength	-.267	.018	<0.001
Education→Smoking	.039	.025	.120
Adult SEP→Smoking	.107	.025	<0.001
Smoking→Adult grip strength	.067	.017	<0.001
Adult SEP←→Adult grip strength	-.046	.019	.016
Child SEP←→Child health	.026	.020	.186
Model 3.2			
Child SEP→Adult SEP	.087	.017	<0.001
Child SEP→Adult grip strength	-.005	.020	.809
Child SEP→Education	.328	.019	<0.001
Child SEP→Physical activity	.001	.028	.964
Child health→Adult SEP	.032	.016	.050
Child health→Adult grip strength	-.048	.017	.004
Child health→Education	.017	.018	.353
Education→Adult SEP	.568	.014	<0.001
Education→Adult grip strength	-.184	.020	<0.001
Education→ Physical activity	.238	.034	<0.001
Adult SEP→ Physical activity	.016	.035	.653
Physical activity →Adult grip strength	-.311	.022	<0.001
Adult SEP←→Adult grip strength	-.038	.058	.069
Child SEP←→Child health	.027	.020	.179